

# RULES AND REGULATIONS

## Title 22—EDUCATION

### STATE BOARD OF EDUCATION

#### [22 PA. CODE CHS. 3—6]

#### Academic Standards and Assessment

The State Board of Education (Board) hereby deletes Chapters 3, 5 and 6 and adds a new Chapter 4 (relating to academic standards and assessment), to read as set forth in Annex A, under authority of the Public School Code of 1949 (24 P. S. §§ 1-101—27-2702).

Notice of proposed rulemaking was published at 28 Pa.B. 3875 (August 8, 1998) with an invitation to submit written comments within 30 days.

#### *Purpose and Requirements*

Chapter 4, which replaces Chapters 3, 5 and 6 (relating to student testing; curriculum; and vocational-technical education) provides single, clear, concise and comprehensive regulations focused on academic standards. For purposes of 1 Pa.C.S. § 1937 (relating to reference to statutes and regulations), this chapter is a new substitute for Chapters 3, 5 and 6. Chapter 4 sets forth requirements for instruction, graduation, strategic planning and assessment based on academic standards.

#### *Comments and Responses*

Forty-four letters were received by the Board during the formal public comment period on proposed Chapter 4. The House and Senate Education Committees, in considering the proposed amendments, each conducted 2 days of hearings during which more than 40 individuals and organizations came forward to offer their comments on the amendments. The results of those hearings were communicated in letters received by the Board from those Committees. Staff of the Independent Regulatory Review Commission (IRRC) offered further comments based on their review of public, House and Senate Education Committee comments as well as their independent review of the amendments. These comments added to the Board's understanding of issues developed in 26 hearings prior to drafting proposed amendments.

Support for the proposed amendments and the implementation of academic standards and assessments was broad-based, coming from educators, business leaders, parents and a variety of education professional organizations. Supporters of the proposed amendments agreed that academic standards are essential to improve the quality and accountability of education in this Commonwealth. This support was not unqualified; most of these parties offered suggestions for improvement and clarification of the document or suggested the reconsideration of certain key elements of the proposed amendments, or both. A number of individuals strongly disagreed with the design and direction of the final-form regulations. Many of them also suggested reconsideration of certain provisions of the proposed amendments. Few comments questioned the quality of the academic standards contained in Appendix A.

*Graduation requirements.* The Senate Committee, members of the House Committee and staff of IRRC sought greater clarity in the graduation requirements including a determination of whether and when a proficient level on State assessments is required for graduation. Language in § 4.24(a) (relating to high school graduation require-

ments) was amended in the final-form version to clarify that students graduating in 2002-2003 must demonstrate the attainment of academic standards in reading, writing and mathematics at the proficient level on State assessments or local assessments aligned with the academic standards and State assessments.

*Strategic plan approval.* Members of the House Education Committee recommended that the Department be required to approve strategic plans required under § 4.13 (relating to strategic plans) to be filed by school districts and area vocational technical schools (AVTSs). The Senate Committee commented that the Department should not be required to do so. The Board elected to make no revision to this section on final-form because the strategic planning process is well established in schools, and its submission to the Department should be sufficient to ensure that appropriate planning is taking place.

*School entity.* Public commentators, members of the House Committee, and the Senate Committee and IRRC staff suggested that the general phrase "school entity" obfuscated the distinct responsibilities of school districts, AVTSs and intermediate units under these amendments. Some commentators suggested that intermediate units might be in the position of developing curricula and graduation requirements for local schools. Comments were also received regarding the applicability of these amendments to charter schools. Specific reference to school districts (including charter schools) and AVTSs has replaced "school entity." In a limited number of instances, reference is also made to intermediate units.

*Aligning dates.* Members of the House Committee, the Senate Committee and IRRC staff recommended that dates for implementation of various subsections be clarified and aligned. Changes have been made to align the dates for the implementation of new graduation requirements (§ 4.24(a)), seals of proficiency (§ 4.24(b) and (c)) on final-form. In addition, the date by which strategic plans under § 4.13 must be submitted has been revised in § 4.83 (relating to implementation schedule) on final-form.

*Nondiscrimination language.* Public commentators questioned the inclusion of sexual orientation in the nondiscrimination language in § 4.4(c) (relating to general policies) and questioned whether this offered protection for curriculum that might explore sexual orientation. The Board's intent is to protect a student's right to access to education and not specific elements of the curricula. IRRC staff recommended changing the language to more clearly state this intention. This language has been incorporated in § 4.4(c).

*Additional elements in strategic plans.* Members of the House Committee recommended that one element of the strategic plans under § 4.13 be a plan for the provision of additional instructional opportunities. IRRC staff recommended that examples of additional instructional opportunities as required under § 4.21(j) and (k) (relating to elementary education: primary and intermediate levels) be given in the final-form regulations. The Board added a requirement in § 4.13(c)(11) on final-form for a plan for additional instructional opportunities for students not achieving at the proficient level. The plan shall include identification procedures, alternate instructional strategies and opportunities for extended learning time. The Senate Committee recommended that a school safety plan be a required element of the strategic plan. After consid-

eration, the Board decided that such a plan should be specified in Chapter 12 (relating to students) and will seek to add the requirement as it amends that chapter.

*World language proficiency.* Public commentators and members of the House Committee recommended the continuation of a world language proficiency requirement for graduation, which was being phased in slowly under Chapter 5. IRRC staff recommends that if it was not the Board's intent to require a world language proficiency for graduation then § 4.25(c) (relating to languages) should be eliminated. There was considerable discussion of and comment on this issue throughout the Board's deliberations. The Board did not add language to specifically require world language proficiency for graduation and eliminated § 4.25(c) in the final-form version. In doing so, the Board noted that, under § 4.12 (relating to academic standards) it is scheduled to adopt world language standards as a requirement for schools and students. At the time those standards are adopted, the relationship to graduation will be specified.

*Opt-out provisions on State assessments.* Public commentators recommended that parents be allowed to opt their children out of State assessments for any reason in § 4.4(d)(4). Some members of the House Committee supported a general opt-out provision while others recommended permitting no opting out of State assessments. The Senate Committee considered this issue and recommended that opt out be allowed only for religious reasons. The Board is concerned that continuing the general opt out provisions of Chapter 5 would limit the validity of the assessments and the information they can provide to the public about schools. No change was made in this provision in the final-form version.

*Limitations on surveys.* Section 4.4(d)(6) requires parental consent for students to participate in any research studies or surveys conducted by outside entities. Public commentators and members of the House Committee recommended that parental consent be required for research studies or surveys conducted by school districts. During the course of developing the proposed amendments, the Board heard concerns from educators that much of what schools do could be construed to be a study or survey, including tests, and that requiring parental consent for surveys would interfere in the normal operations of the school. Most school boards have in place policies on surveys and studies and procedures for their approval. No change was made in the final-form version.

*Revise and add definitions.* Members of the House Committee and IRRC staff suggested a definition be added for "strategic plan"; the Board added this definition in the final-form version. IRRC staff recommend a clarification in definitions for "instruction" and "planned instruction" and asked that some of the definition of "planned instruction" be placed in § 4.11 (relating to purpose of public education). The Board eliminated a definition of "instruction" and amended the definition of "planned instruction" in § 4.3 (relating to definitions), and further described planned instruction in § 4.11(h) in the final-form version. The definition of "parent or guardian" in § 4.3 and "irony" in the glossary the reading, writing, speaking and listening standards of Appendix A have been modified in the final-form version according to the recommendation of IRRC staff.

*Accommodations and alternate assessments for special education students.* Public commentators, the Senate Committee and IRRC staff recommended that special education students have an opportunity to achieve seals of proficiency and distinction through accommodations on

the State assessment. Additional comments suggested that achievement of proficiency on alternate forms of assessment or in standards of performance established in IEPs also qualify for seals. The Board decided that special needs students should be provided the necessary accommodations but must demonstrate the same level of attainment of academic standards to earn a seal. Language has been added to § 4.24(b),(c) and (f) to ensure that special education students provided with accommodations have the opportunity to earn the seals.

*Submission of additional academic standards.* Members of the House Committee, the Senate Committee and IRRC staff recommended a revision in the schedule for submission of additional academic standards occurring beyond the date of final rulemaking. The schedule has been revised under § 4.12(g). Public commentators questioned whether the additional academic standards would be promulgated through the regulatory review process. IRRC staff recommended that language be added to clarify the intent of the Board to promulgate additional academic standards. Language to that effect has been added to § 4.12(c).

*Fiscal impact.* Public commentators, members of the House and Senate Committees and IRRC staff commented on the potential cost of the implementation of these amendments. Additional information is found under the Cost and Paperwork Estimates section of this Pre-ambule.

*Add standards for agricultural education and vocational education.* Public commentators, members of the House Committee, the Senate Committee and IRRC staff recommended that agricultural education be added under §§ 4.11(g) and 4.12(a) as a separate, multidisciplinary standard and that additional language regarding agricultural education be added in the curriculum listings in §§ 4.21—4.23. Minor changes in the description of the science and technology standards in § 4.12(a)(1) and in the description of agricultural education in the curriculum listing in § 4.22(c)(3) and (5) were made in the final-form version. The Board decided not to establish agricultural education as a separate standard area and noted that it would carefully review emerging standards in science and technology and environment and ecology to ensure that they include comprehensive standards for agricultural education. The Senate Committee and IRRC staff recommended the development of standards for vocational education and assessments based upon them. The Board is aware that much is being done to develop standards and assessments for the wide variety of vocational programs but believes that the current process for establishing standards and options for assessment are sufficient. The Board will continue to monitor the development of vocational skill standards and their readiness for inclusion in this chapter.

*Comparability of local assessment.* Members of the House and Senate Committees and IRRC staff recommended that there be established a process for determining the comparability of local assessment. Language under § 4.24(a) was changed so that local assessments must be aligned with academic standards and State assessments. The most certain evidence of the comparability or degree of alignment between these assessments will come from repeated administrations of State assessments and local assessments. If it becomes apparent that large numbers of students not achieving at the proficient level on State assessments are deemed proficient by local assessments, regulation and administrative review will

become important. Until then, the Board does not feel the extra administrative burden for schools and the Department is warranted.

*HIV/AIDS instruction.* The Senate Committee recommended that § 4.29 (relating to HIV/AIDS and other life-threatening and communicable diseases), regarding instruction about HIV/AIDS be eliminated as a separate section and included under health and physical education. Discussion during the Senate Education Committee hearing on Chapter 4 questioned why HIV/AIDS should be singled out as a health concern when there were other life-threatening and communicable diseases about which students should learn. The Board decided to retain a separate section on HIV/AIDS in the final-form version and to expand it to include instruction in other life-threatening and communicable diseases.

*Affidavit for religious and nonpublic schools.* One public commentator, the Senate Committee and IRRC staff recommended that § 4.71 (relating to certification by principal of nonpublic nonlicensed school) be corrected to reflect current law and specifically the different instructional requirements for religious schools. In the final-form version, the Board elected to correct the citations to current law and to direct that the certification be filed in the form determined by the Secretary of Education, thus eliminating the affidavit in the body of the chapter.

*Editing and correcting.* Various drafting errors and changes recommended for clarity and consistency suggested by public commentators, members of the House Committee, the Senate Committee, IRRC staff and by the Board's own review were made in the final-form regulations.

#### *Affected Parties*

These final-form regulations affect the students and professional employees of the public schools of this Commonwealth (including intermediate units, AVTSs, public charter and alternative schools). Provisions in § 4.71 affect nonpublic nonlicensed schools. Sections 4.71—4.74 set forth provisions relating to and affecting students in other than public schools. Nothing in final-form Chapter 4 is intended to change or go beyond the current homeschooling law.

#### *Cost and Paperwork Estimates*

Chapter 5 required students to achieve a broad array of 53 learning outcomes prior to graduation. Chapter 4 will require students to achieve academic standards in specific academic areas during their education. The requirement in Chapter 5 for portfolio assessment of student work has been eliminated. These changes will yield modest cost savings to schools by: (1) focusing the curriculum; and (2) eliminating training and evaluation costs associated with portfolio assessment.

Costs to implement these final-form regulations for a school district or AVTS may include curriculum development, professional development of teachers and additional remediation efforts. Testimony and discussions during the development of these final-form regulations suggests that schools in this Commonwealth will require some additional resources to adjust to the new requirements. Schools have in place strategic planning processes, professional development systems, curriculum review and development processes, assessment systems and processes to monitor instruction and student progress. These components provide school districts and AVTSs with the foundation to integrate Chapter 4 requirements into their

curriculum. Technical assistance in the implementation of academic standards will be provided by the Department and intermediate units.

The Commonwealth currently provides more than \$5.6 billion to local schools, as part of the nearly \$14 billion invested in elementary and secondary education by taxpayers, to educate students and to provide them with the skills and knowledge necessary to succeed in the workplace, in postsecondary studies and as citizens. These final-form regulations are designed to ensure that students are educated to high standards, and through the use of State assessments, to ensure that the citizens of this Commonwealth have a means to measure the ability of schools to deliver on their promise. State resources currently provided to schools should be sufficient to meet the general requirements of these final-form regulations.

To address the needs of schools in relation to specific elements of the final-form regulations, a \$3 million line item was added in the 1998-99 Fiscal Year for the professional development of educators implementing academic standards. In addition, \$20 million in Federal funds is available to support professional and curriculum development related to academic standards in current and subsequent fiscal years. Moneys to support the State assessment system were increased from \$6 to \$9 million in the current year appropriation to meet the requirements of these regulations. Continued increased funding is planned to cover both the ongoing expenses of curriculum and professional development and an expanded assessment system.

Much of the debate regarding potential costs for these final-form regulations centered on the identification of students not achieving proficiency in the early elementary years and the provision of additional instructional opportunities to enable them to achieve proficiency. This requirement supplements existing Federal, State and local programs designed to identify students in learning difficulty early and to provide additional efforts to develop their basic skills. The Governor has proposed \$100 million over the next 4 years in the "Read to Succeed" program to support the identification and remediation of students not proficient in basic skills.

Chapter 4 requires limited, additional paperwork for school districts and AVTSs by calling for a plan that will provide additional learning opportunities for students not achieving proficiency as part of the strategic planning process under § 4.13.

#### *Effective Date*

These final-form regulations will become effective upon final publication in the *Pennsylvania Bulletin*.

#### *Sunset Date*

The effectiveness of Chapter 4 will be reviewed by the Board every 4 years, in accordance with the Board's policy and practice respecting all regulations promulgated by the Board. Thus, no sunset date is necessary.

#### *Regulatory Review*

Under section 5(a) of the Regulatory Review Act (71 P. S. § 745.5(a)), the Board submitted a copy of the notice of proposed rulemaking published at 28 Pa.B. 3875 to IRRC and to the Chairpersons of the House and Senate Committees on Education. In compliance with section 5(b.1) of the Regulatory Review Act, the Board also provided IRRC and the Committees with copies of the comments received as well as other documentation.

In preparing these final-form regulations, the Board has considered the comments received from IRRC, the Committees and the public.

These final-form regulations were approved by the House Education Committee on November 10, 1998, the Senate Education Committee on November 16, 1998, and were approved by IRRC on November 19, 1998, in accordance with section 5(c) of the Regulatory Review Act.

#### Contact Person

The official responsible for information on these final-form regulations is Peter H. Garland, Executive Director, State Board of Education, 333 Market Street, Harrisburg, PA 17126-0333, (717) 787-3787 or TDD (717) 787-7367.

#### Findings

The Board finds that:

(1) Public notice of the intention to adopt these final-form regulations was given under sections 201 and 202 of the act of July 31, 1968 (P. L. 769, No. 240) (45 P. S. §§ 1201 and 1202) and the regulations promulgated thereunder in 1 Pa. Code §§ 7.1 and 7.2.

(2) A public comment period was provided as required by law and all comments were considered.

(3) The regulations are necessary and appropriate for the administration of the Public School Code of 1949.

#### Order

The Board, acting under the authorizing statute, orders that:

(a) The regulations of the Board, 22 Pa. Code Chapters 3—6, are amended by adding §§ 4.1—4.4, 4.11—4.13, 4.21—4.29, 4.31—4.35, 4.41, 4.42, 4.51, 4.52, 4.61, 4.71—4.74, 4.81—4.84 and Appendix A; and by deleting §§ 3.1—3.4, 3.7, 3.11—3.13, 3.21, 3.22, 5.1—5.4, 5.201—5.203, 5.211—5.220, 5.221—5.223, 5.231, 5.232, 5.241—5.244 and 5.251—5.253, 6.1—6.3, 6.21—6.23, 6.52, 6.63, 6.71 and 6.81 to read as set forth in Annex A.

(b) The Executive Director will submit this order and Annex A to the Office of General Counsel and the Office of Attorney General for review and approval as to legality and form as required by law.

(c) The Executive Director of the Board shall certify this order and Annex A and deposit them with the Legislative Reference Bureau as required by law.

(d) This order is effective upon final publication in the *Pennsylvania Bulletin*.

PETER H. GARLAND,  
*Executive Director*

*(Editor's Note: For the text of the order of the Independent Regulatory Review Commission relating to this document, see 28 Pa.B. 5920 (December 5, 1998).)*

**Fiscal Note:** Fiscal Note 6-265 remains valid for the final adoption of the subject regulations.

### Annex A

#### TITLE 22. EDUCATION

#### PART I. STATE BOARD OF EDUCATION

#### CHAPTER 3. (Reserved)

§§ 3.1—3.4. (Reserved).

§ 3.7. (Reserved).

§§ 3.11—3.13. (Reserved).

§ 3.21. (Reserved).

§ 3.22. (Reserved).

## CHAPTER 4. ACADEMIC STANDARDS AND ASSESSMENT

### GENERAL PROVISIONS

- Sec.  
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4.2. Purpose.  
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### ACADEMIC STANDARDS AND PLANNING

- 4.11. Purpose of public education.  
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### CURRICULUM AND INSTRUCTION

- 4.21. Elementary education: primary and intermediate levels.  
4.22. Middle level education.  
4.23. High school education.  
4.24. High school graduation requirements.  
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- 4.31. Vocational-technical education.  
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4.34. Programs and equipment.  
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### SCHEDULING AND LEARNING OPTIONS

- 4.41. Scheduling.  
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- 4.61. School profiles.

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- 4.71. Certification by principal of nonpublic nonlicensed school.  
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- 4.81. Allegations of deficiencies.  
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### GENERAL PROVISIONS

#### § 4.1. Statutory authority.

The statutory authority for this chapter is the School Code.

#### § 4.2. Purpose.

The purpose of this chapter is to establish rigorous academic standards and assessments to facilitate the improvement of student achievement and to provide parents and communities a measure by which school performance can be determined.

#### § 4.3. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

*AVTS—Area vocational-technical school*—A public school that provides vocational-technical education to secondary school students, out-of-school youth and adults in a geographical area comprised and operated by one or

more school districts and established under sections 1840—1853 of the School Code (24 P. S. §§ 18-1840—18-1853).

*Academic standard*—What a student should know and be able to do at a specified grade level.

*Assessment*—A valid and reliable measurement of student performance on a set of academic standards in a subject area.

*Apprenticeship program*—A competency-based program that coordinates and integrates classroom instruction with a structured work-based employment experience designed for students.

*Board*—The State Board of Education established by sections 2601-B—2606-B of the School Code (24 P. S. §§ 26-2601-B—26-2606-B).

*Cooperative vocational-technical education*—A planned method of instruction developed through a signed cooperative arrangement among school representatives, students, parents and employers in the community to provide students with an opportunity to alternate in-school academic and vocational-technical instruction in entry-level paid employment in an occupational field, in which the student's total occupational work experience is planned, coordinated and supervised by the school in close cooperation with the employer.

*Curriculum*—A series of planned instruction that is coordinated and articulated and implemented in a manner designed to result in the achievement by all students of specific knowledge and skills and the application of this knowledge.

*Department*—The Department of Education of the Commonwealth.

*ESOL*—English to speakers of other languages.

*Employment area*—A geographic area where vocational-technical education program completers are most likely to be employed.

*Individuals with Disabilities Education Act*—20 U.S.C.A. §§ 1400—1485.

*Intermediate unit*—A regional educational service agency established under sections 951—974 of the School Code (24 P. S. §§ 9-951—9-974), which provides educational services to participating school districts as part of the public school system of this Commonwealth.

*Parent or guardian*—A person legally responsible for a student's care.

*Planned instruction*—Instruction offered by a school district or AVTS based upon a written plan to enable students to achieve the academic standards under § 4.12 (relating to academic standards) and additional academic standards determined in strategic plans under § 4.13 (relating to strategic plans).

*School Code*—The Public School Code of 1949 (24 P. S. §§ 1-101—27-2702).

*Secretary*—The Secretary of Education of the Commonwealth.

*School organization*—The organization of a school district's programs into kindergarten, primary, intermediate level, middle level and high school programs, including programs operated at AVTSs.

*Strategic plan*—A comprehensive plan for education developed under § 4.13.

*Tech-prep program*—A combined secondary and postsecondary program which leads to an associate degree or certificate and employment by providing technical preparation in engineering technology, applied science, mechanical, industrial or practical art or trade, agriculture, health or business, including development of competence in mathematics, science and communications through a sequential course of study.

*Vocational-technical education*—Programs under public supervision and control which provide an organized process of learning experiences designed to develop integrated academic and occupational skills, knowledge, attitudes, work habits and leadership ability for entry into and advancement within various levels of employment in occupational areas of agriculture, business, marketing and distribution, health, home economics and trade and industry and for participation in postsecondary education and training.

**§ 4.4. General policies.**

(a) It is the policy of the Board that the local curriculum be designed by school districts (including charter schools) and AVTSs to achieve the academic standards under § 4.12 (relating to academic standards) and additional academic standards designated in strategic plans under § 4.13 (relating to strategic plans).

(b) It is the policy of the Board that local school districts (including charter schools) and AVTSs have the greatest possible flexibility in curriculum planning consistent with providing quality education and in compliance with the School Code, including requirements for courses to be taught (24 P. S. §§ 15-1501 and 16-1605), subjects to be taught in the English language (24 P. S. § 15-1511), courses adapted to the age, development and needs of the pupils (24 P. S. § 15-1512), minimum school year of 180 days and minimum of 900 hours of instruction at the elementary level and 990 hours of instruction at the secondary level (24 P. S. §§ 15-1501 and 15-1504), employment of sufficient numbers of qualified professional employes (24 P. S. § 11-1106) and superintendents to enforce the curriculum requirements of State law (24 P. S. § 10-1005), and this part.

(c) Access to educational programs shall be provided without discrimination on the basis of a student's race, sex, color, religion, disability, sexual orientation or national origin.

(d) School districts (including charter schools), AVTSs and intermediate units shall adopt policies to assure that parents or guardians have the following:

(1) Access to information about the curriculum, including academic standards to be achieved, instructional materials and assessment techniques.

(2) A process for the review of instructional materials.

(3) The right to have their children excused from specific instruction which conflicts with their religious beliefs, upon receipt by the school district (including charter schools), AVTS or intermediate unit of a written request from the parents or guardians.

(4) If upon inspection of State assessments parents or guardians find the assessments in conflict with their religious belief and wish their student be excused from the assessment, the right of the parents or guardians will not be denied upon written request to the applicable school district superintendent or AVTS director.

(5) Opportunity for involvement in the strategic planning process under § 4.13.

(6) The right to have their children excluded from research studies or surveys conducted by entities other than the school district (including charter schools), AVTS or intermediate unit unless prior written consent has been obtained.

(7) The right of the parent or guardian to review the State assessments in the school district 2 weeks prior to their administration during convenient hours for parents and guardians. All necessary security requirements to maintain the validity of the assessment shall be taken in accordance with the State assessment administration instructions.

#### ACADEMIC STANDARDS AND PLANNING

##### § 4.11. Purpose of public education.

(a) This section and §§ 4.12 and 4.13 (relating to academic standards and planning) describe the purpose of public education, the academic standards, their relationship with one another and strategic plans.

(b) Public education prepares students for adult life by attending to their intellectual and developmental needs and challenging them to achieve at their highest level possible. In conjunction with families and other community institutions, public education prepares students to become self-directed, life-long learners and responsible, involved citizens.

(c) Together with parents, families and community institutions, public education provides opportunities for students to:

- (1) Acquire knowledge and skills.
- (2) Develop integrity.
- (3) Process information.
- (4) Think critically.
- (5) Work independently.
- (6) Collaborate with others.
- (7) Adapt to change.

(d) The academic standards describe the knowledge and skills which students will be expected to demonstrate before graduating from a public school.

(e) Achievement of high academic standards in public education is dependent upon the quality of instruction in schools and student effort supported by the involvement of family and community.

(f) Assessment in public education is designed to determine student attainment of State and local academic standards.

(g) Public schools provide instruction throughout the curriculum so that students may develop knowledge and skills in the following areas:

- (1) Reading, writing, speaking and listening.
- (2) Mathematics.
- (3) Science and technology.
- (4) Environment and ecology.
- (5) Social studies (civics and government, geography, economics and history).
- (6) Arts and humanities.
- (7) Career education and work.
- (8) Health, safety and physical education.
- (9) Family and consumer science.
- (10) World languages.

(h) Public education provides planned instruction to enable students to attain academic standards under § 4.12. Planned instruction consists of at least the following elements:

(1) Objectives of a planned course, instructional unit or interdisciplinary studies to be achieved by all students.

(2) Content, including materials and activities, and estimated instructional time to be devoted to achieving the academic standards. Courses, instructional units or interdisciplinary studies of varying lengths of time may be taught.

(3) The relationship between the objectives of a planned course, instructional unit or interdisciplinary studies and academic standards specified under § 4.12 (relating to academic standards) and to those determined in the school district's (including charter schools) or AVTS's strategic plan under § 4.13 (relating to strategic plans).

(4) Procedures for measurement of the objectives of a planned course, instructional unit or interdisciplinary studies.

##### § 4.12. Academic standards.

(a) School districts (including charter schools) or AVTSs may develop, expand or improve existing academic standards in the following content areas until the Board adopts standards under subsection (g) and rescinds the description of the corresponding content area:

(1) *Science and technology.* Study of the natural world and facts, principles, theories and laws in the areas of biology, chemistry, physics and earth sciences. Technology is the application of science to enable societal development including food and fiber production, manufacturing, building, transportation and communication. Science and technology share the use of the senses, science processes, inquiry, investigation, analysis and problem solving strategies.

(2) *Environment and ecology.* Understanding the components of ecological systems and their interrelationships with social systems and technologies. These components incorporate the disciplines of resource management, agricultural diversity, government and the impact of human actions on natural systems. This interaction leads to the study of watersheds, threatened and endangered species, pest management and the development of laws and regulations.

(3) *Social studies.*

(i) *History.* Study of the record of human experience including important events; interactions of culture, race and ideas; the nature of prejudice; change and continuity in political systems; effects of technology; importance of global-international perspectives; and the integration of geography, economics and civics studies on major developments in the history of the Commonwealth, the United States and the world.

(ii) *Geography.* Study of relationships among people, places and environments, of geographic tools and methods, characteristics of place, concept of region and physical processes.

(iii) *Civics and government.* Study of United States constitutional democracy, its values and principles, study of the Constitution of the Commonwealth and government including the study of principles, operations and documents of government, the rights and responsibilities of citizenship, how governments work and international relations.

(iv) *Economics.* Study of how individuals and societies choose to use resources to produce, distribute and con-

sume goods and services. Knowledge of how economies work, economic reasoning and basic economic concepts, economic decision making, economic systems, the Commonwealth and the United States economy and international trade.

(4) *Arts and humanities.* Study of dance, theatre, music, visual arts, language and literature including forms of expression, historical and cultural context, critical and aesthetic judgment and production, performance or exhibition of work.

(5) *Career education and work.* Understanding career options in relationship to individual interests, aptitudes and skills including the relationship between changes in society, technology, government and economy and their effect on individuals and careers. Development of knowledge and skill in job-seeking and job-retaining skills and, for students completing vocational-technical programs, the skills to succeed in the occupation for which they are prepared.

(6) *Health, safety and physical education.* Study of concepts and skills which affect personal, family and community health and safety, nutrition, physical fitness, movement concepts and strategies, safety in physical activity settings, and leadership and cooperation in physical activities.

(7) *Family and consumer science.* Understanding the role of consumers as a foundation for managing available resources to provide for personal and family needs and to provide basic knowledge of child health and child care skills.

(8) *World languages.* Ability to communicate in a language other than English, including the ability to understand and interpret written and spoken language on a variety of topics and to develop knowledge and understanding of other cultures.

(b) In designing educational programs, school districts (including charter schools) and AVTSs shall provide for the attainment of the academic standards under subsections (a) and (c) and any additional academic standards which they describe in their strategic plans under § 4.13(c) (relating to strategic plans). Attaining the academic standards in this section requires students to demonstrate the acquisition and application of knowledge.

(c) School districts (including charter schools) and AVTSs shall prepare students to attain academic standards in mathematics, reading, writing, speaking and listening as contained in Appendix A and incorporated here by reference and additional standards as may be adopted by the Board and promulgated as amendments to this chapter.

(d) A school district's (including charter schools) or AVTS's curriculum shall be designed to provide students with instruction needed to attain these academic standards.

(e) School districts (including charter schools) and AVTSs shall apply academic standards for students in all areas described under subsections (a) and (c). The local assessment plan under § 4.52 (relating to local assessment system) shall include a description of how the academic standards will be measured and how information from the assessments is used to assist students having difficulty meeting the academic standards.

(f) School districts (including charter schools) and AVTSs shall assess the attainment of academic standards developed under subsections (a) and (c) and any other academic standards which they develop and describe in

their strategic plans under § 4.52(c) for purposes of high school graduation and strategies for assisting students to attain them. Plans for assessment developed by school districts (including charter schools) and AVTSs will take into account that academic standards in subsections (a) and (c) may be attained by students in various ways and shall be assessed in various ways. Children with disabilities may attain the academic standards by completion of their Individualized Education Programs under the Individuals with Disabilities Education Act and this part.

(g) In developing academic standards in subsection (a) content areas, the Secretary will consult with educators, business and community leaders and parents. Academic standards in the following content areas will be developed by the Secretary and presented to the Board no later than the following schedule:

April, 1999	Science and Technology Environment and Ecology Health, Safety and Physical Education Civics and Government
June, 1999	Arts and Humanities
October, 1999	Family and Consumer Sciences Economics Geography
September, 2000	History Career Education and Work World Languages

(h) School districts (including charter schools) and AVTSs are responsible under subsections (a), (c), (g) and § 4.13(c)(5) for assessing individual student attainment of academic standards and for assisting those students having difficulty attaining them. Upon request by a school district (including charter schools) or AVTS, the Department will provide the requestor with technical assistance in the development of academic standards and assessments that are sufficient to assure that students are making progress toward the attainment of standards required for high school graduation under subsection (f) and those identified in the strategic plan under § 4.13(c)(3).

(i) Every 3 years, the Board will review the State academic standards and State assessments under this section to determine if they are appropriate, clear, specific and challenging, and will make revisions as necessary by revising this chapter.

**§ 4.13. Strategic plans.**

(a) Every school district (including charter schools) shall develop and file with the Department a strategic plan once every 6 years and review that plan for revision at the mid-point according to an implementation schedule developed by the Department under § 4.83 (relating to implementation schedule). A school district plan shall incorporate appropriate components of the plan submitted under subsection (b) by an AVTS in which the district participates. In the development of a strategic plan, a school district (including charter schools) will, upon request, receive technical assistance from the Department.

(b) Every AVTS, in conjunction with and with the approval of the majority of its participating school districts, shall develop and file with the Department a strategic plan once every 6 years and review that plan at the mid-point according to an implementation schedule developed by the Department under § 4.83. The strategic plan shall incorporate appropriate components of the

strategic plan submitted under subsection (a) by participating districts. In the development of the strategic plan, an AVTS will, upon request, receive technical assistance from the Department.

(c) The strategic plan shall be based upon an analysis of internal and external needs, leading to the specification of priorities for action and action plans. The requirement in subsections (a) and (b) to develop plans every 6 years and revisions every 3 years does not limit a school district's (including charter schools) or AVTS's ability to conduct a continuous strategic planning process. The plan shall include the following components in addition to others the school district (including charter schools) or AVTS determines to include:

- (1) A mission statement.
- (2) A listing of the school district's (including charter schools) or AVTS's educational and organizational goals as they relate to student achievement and high school graduation requirements.
- (3) A description of academic standards for student achievement which shall be consistent with those under § 4.12 (relating to academic standards).
- (4) The planned instruction to be offered and the instructional and assessment practices to be used to strive for the academic goals and attain academic standards under paragraph (3) and the high school graduation requirements under § 4.24 (relating to high school graduation requirements).
- (5) An assessment plan under § 4.52 (relating to local assessment system) designed to determine the degree to which students are achieving academic standards under paragraph (3) including descriptions of methods and measures used to determine achievement, how information from the assessments shall be used to assist students who have not demonstrated attainment of the academic standards at a proficient level or higher and how information from the assessments shall be made available to the public.
- (6) A plan for improving students' achievement, including specific, measurable goals for student growth and plans (including those listed in this section) that are designed to attain students' achievement goals. Achievement goals shall demonstrate a connection to the academic standards under § 4.12 including but not limited to annual improvement goals for student scores on State and local assessments.
- (7) The professional development plan under section 1205.1 of the School Code (24 P.S. § 12-1205.1) and § 49.17 (relating to continuing professional development) and the induction plan under § 49.16 (relating to approval of induction plans).
- (8) A description of the school district's (including charter schools) or AVTS's organization and organizational goals and their relationship to differing student needs within the school district's (including charter schools) or AVTS's goals under paragraph (2) and the attainment of academic standards under paragraph (3).
- (9) A description of the professional personnel, school library, classroom and other resources the school district (including charter schools) or AVTS plans to devote to the attainment of academic standards.
- (10) A brief description of the process used to develop the strategic plan, including a list of persons involved in its development.

(11) A plan for additional instructional opportunities for students not achieving at the proficient level including identification procedures, alternate instructional strategies, monitoring of assessment procedures and opportunities for extended learning time.

(d) Strategic plans shall be developed through active participation by parents, students, school directors, teachers, school administrators, other school personnel, business and other community representatives. Teacher representatives shall be chosen by teachers, and administrative representatives shall be chosen by the administrative personnel, and school director representatives shall be chosen by the board of the school district or AVTS.

(e) Prior to its approval by the board of directors, the strategic plan and revisions of it shall be made available for public inspection in the school district's or AVTS's offices and nearest public library until the next regularly scheduled board meeting or a minimum of 28 days whichever comes first. The plan shall be filed with the Department after it is recommended by the school superintendent of record and is approved by the school district's or AVTS's board of directors. If the board of directors alters the proposed strategic plan developed under subsection (d), it shall consult with the committee which developed it to reach the greatest possible consensus prior to its submission and shall include any minority report which is developed.

(f) A locally approved strategic plan shall remain in effect until it is superseded by a locally approved revision or a new strategic plan developed under this section.

#### CURRICULUM AND INSTRUCTION

##### § 4.21. Elementary education: primary and intermediate levels.

(a) The primary program shall ordinarily be completed by children who are approximately 8 years of age. School districts shall provide opportunities for individualized rates of learning and social and emotional development that reflect differing rates of development and learning styles of young children.

(b) Curriculum and instruction in the primary program shall focus on introducing young children to formal education, developing an awareness of the self in relation to others and the environment, and developing skills of communication, thinking and learning.

(c) The intermediate level program shall ordinarily be completed by children who are approximately 11 years of age.

(d) Curriculum and instruction in the intermediate level program shall continue the development of communication, thinking and learning skills and shall begin to focus on learning specific subject matter content.

(e) Planned instruction in the following areas shall be provided to every student every year in the primary program. Planned instruction may be provided as separate course or as an instructional unit within another course or other interdisciplinary instructional activity.

(1) Language arts, integrating reading, writing, phonics, spelling, listening, speaking, literature and grammar, and information management, including library skills.

(2) Mathematics, including problem-solving and computation skills.

(3) Science and technology education, involving active learning experiences for students.



(4) Environment and ecology education, involving active learning experiences for students.

(5) Social studies (civics and government, economics, geography and history).

(6) Health, safety and physical education, including instruction in concepts and skills which affect personal, family and community health and safety, nutrition, physical fitness, movement concepts, motor skill development, safety in physical activity settings, and the prevention of alcohol, chemical and tobacco abuse.

(7) The arts, including active learning experiences in art, music, dance and theatre.

(f) Planned instruction in the following areas shall be provided to every student every year in the intermediate level program. Planned instruction may be provided as a separate course or as an instructional unit within another course or other interdisciplinary instructional activity:

(1) Language arts, integrating reading, writing, spelling, listening, speaking, literature and grammar.

(2) Mathematics, including problem-solving and computation skills.

(3) Science and technology, including, when appropriate, instruction about agriculture and agricultural science.

(4) Environment and ecology, including, when appropriate, instruction about agriculture and agricultural science.

(5) Social studies (civics and government, economics, geography and history).

(6) The arts, including art, music, dance and theatre.

(7) Understanding and use of library and other information sources.

(8) Health, safety and physical education, including instruction in concepts and skills which affect personal, family and community health and safety, nutrition, physical fitness, movement concepts, motor skill development, safety in physical activity settings, and the prevention of alcohol, chemical and tobacco abuse.

(g) Planned instruction in the following areas shall be provided to every student at least once by the end of elementary school. Planned instruction may be provided as a separate course or as an instructional unit within another course or other interdisciplinary instructional activity. See section 1511 of the School Code (24 P.S. § 15-1511).

(1) History of the United States.

(2) History of the Commonwealth.

(3) Geography.

(4) Civics.

(h) This section does not preclude the teaching of other planned instruction designed to achieve a school district's, including charter schools, mission, goals and academic standards.

(i) School districts, including charter schools, shall determine the most appropriate way to operate their primary and intermediate level elementary programs to achieve the purposes under subsections (b) and (d) and the mission, goals and academic standards in their strategic plans under § 4.13 (relating to strategic plans).

(j) Beginning in the 2001-2002 school year, students who have not achieved proficiency in reading and mathematics during their primary grades (K-3), as deter-

mined by the school district, (including charter schools) shall be afforded additional instructional opportunities through a grade-level learning plan developed by the school district (including charter schools). The plan will assist the student in acquiring the knowledge and skills necessary to achieve at the proficient level. Assessments to measure proficiency shall be described in the local assessment system under § 4.52 (relating to local assessment system).

(k) Beginning in the 2001-2002 school year, students who have not achieved proficiency in reading and mathematics by the end of grade 5 as determined on State assessments under § 4.51 (relating to State assessment system) shall be afforded instructional opportunities to develop knowledge and skills necessary to achieve the proficient level.

**§ 4.22. Middle level education.**

(a) The middle level program ordinarily serves children who are approximately 11-14 years of age. School districts, including charter schools, may modify the grouping of students based upon student needs identified in their strategic plans under § 4.13 (relating to strategic plans).

(b) Curriculum and instruction in the middle level program shall focus on mastery of academic subjects, the development of critical and creative thinking, information literacy, good health and encourage active participation in the school and community.

(c) Planned instruction in the following areas shall be provided to every student in the middle level program. Planned instruction may be provided as a separate course or as an instructional unit within a course or other interdisciplinary instructional activity:

(1) Language arts, integrating reading, writing, listening, speaking, literature and grammar.

(2) Mathematics, including mathematical reasoning, algebra and problem-solving.

(3) Science and technology, which involves active learning experiences and which may include laboratory experiments and, when appropriate, instruction in agriculture and agricultural science.

(4) Social studies (civics and government, economics, geography and history, including the history and cultures of the United States, the Commonwealth, and the world).

(5) Environment and ecology, including social, political and economic aspects of ecology and when appropriate, instruction in agriculture and agricultural sciences.

(6) Information skills, including access to traditional and electronic information sources, computer use and research.

(7) Health, safety and physical education, including instruction in concepts and skills which affect personal, family and community health and safety, nutrition, physical fitness, movement concepts, motor skill development, safety in physical activity settings, and the prevention of alcohol, chemical and tobacco abuse.

(8) The arts, including art, music, dance and theatre.

(9) Career education, including exposure to various career options and the educational preparation necessary to achieve those options.

(10) Technology education, emphasizing practical application of academic skills and problem-solving experiences facilitated by technology.

(11) Family and consumer science, including principles of consumer behavior and basic knowledge of child health and child care skills.

(d) This section does not preclude the teaching of other planned instruction designed to achieve a school district's, including charter schools, academic standards.

(e) School districts, including charter schools, shall determine the most appropriate way to operate their middle level programs to achieve the purposes under subsection (b) and the academic standards in their strategic plans under § 4.13.

#### § 4.23. High school education.

(a) Instruction in the high school program shall focus on the development of abilities needed to succeed in work and advanced education through planned instruction.

(b) Curriculum and instruction in the high school program shall provide all students opportunities to develop the skills of analysis, synthesis, evaluation and problem-solving, and information literacy.

(c) Planned instruction in the following areas shall be provided to every student in the high school program. Planned instruction may be provided as a separate course or as an instructional unit within a course or other interdisciplinary instructional activity:

(1) Language arts, integrating reading, writing, listening, speaking, literature and grammar.

(2) Mathematics, including problem-solving, mathematical reasoning, algebra, geometry and concepts of calculus.

(3) Science and technology, including participation in hands-on experiments and at least one laboratory science chosen from life sciences, earth and space sciences, chemical sciences, physical sciences and agricultural sciences.

(4) Social studies (civics and government, economics, geography and history, including the history and cultures of the United States, the Commonwealth and the world).

(5) Environment and ecology, including scientific, social, political and economic aspects of ecology.

(6) The arts, including art, music, dance, theatre and humanities.

(7) Use of applications of microcomputers and software, including word processing, database, spreadsheets and telecommunications; and information skills, including access to traditional and electronic information sources, computer use and research.

(8) Health, safety and physical education, including instruction in concepts and skills which affect personal, family and community health and safety, nutrition, physical fitness, movement concepts, motor skill development, safety in physical activity settings, and the prevention of alcohol, chemical and tobacco abuse.

(9) Family and consumer science, including principles of consumer behavior and basic knowledge of child health and child care skills.

(d) The following planned instruction shall be made available to every student in the high school program:

(1) Vocational-technical education under §§ 4.3 and 4.31—4.35 (relating to definitions; and vocational education).

(2) Business education, including courses to assist students in developing business and information technology skills.

(3) World languages under § 4.25 (relating to languages).

(4) Technology education, incorporating technological problem-solving and the impacts of technology on individuals and society.

(e) College-level advanced placement courses may be offered as planned instruction in the high school curriculum.

(f) This section does not preclude the teaching of other planned instruction designed to achieve a school district's, including charter schools, academic standards.

(g) School districts, including charter schools, shall determine the most appropriate way to operate their high school programs to achieve the purposes under subsection (a) and the academic standards in their strategic plans under § 4.13 (relating to strategic plans).

#### § 4.24. High school graduation requirements.

(a) Each school district, including charter schools, shall specify requirements for graduation in the strategic plan under § 4.13 (relating to strategic plans). Requirements shall include course completion and grades, completion of a culminating project, and results of local assessments aligned with the academic standards. Beginning in the 2002-2003 school year, students shall demonstrate proficiency in reading, writing and mathematics on either the State assessments administered in grade 11 or 12 or local assessment aligned with academic standards and State assessments under § 4.52 (relating to local assessment system) at the proficient level or better in order to graduate. The purpose of the culminating project is to assure that students are able to apply, analyze, synthesize and evaluate information and communicate significant knowledge and understanding.

(b) Beginning in the 2002-2003 school year, students who attain a score at the proficient level or better on State assessments in reading, writing and mathematics administered in grade 11 or 12 shall be granted a Pennsylvania Seal of Proficiency. Students with disabilities who meet the required proficiency level on State assessments with appropriate accommodations shall be granted a Pennsylvania Seal of Proficiency.

(c) Beginning in the 2002-2003 school year, students who attain a score at the advanced level of proficiency on State assessments in reading, writing and mathematics administered in grade 11 or 12 shall be granted a Pennsylvania Seal of Distinction. Students with disabilities who meet the required proficiency level on State assessments with appropriate accommodations shall be granted a Pennsylvania Seal of Distinction.

(d) State Seals of Proficiency or Distinction shall be affixed to diplomas and noted on student transcripts.

(e) Each school district, including charter schools, shall describe in its strategic plan under § 4.13 how its planned instruction is designed to prepare students to meet the requirements of subsection (a).

(f) Children with disabilities who satisfactorily complete a special education program developed by an Individualized Education Program team under the Individuals with Disabilities Education Act and this part shall be granted and issued a regular high school diploma by the school district of residence. This subsection applies if the special education program of a child with a disability does not otherwise meet all requirements of this chapter. Children with disabilities who meet the required proficiency level on State assessments shall be granted the appropriate Seal of Proficiency or Distinction.

**§ 4.25. Languages.**

(a) Every school district shall provide instruction in at least two languages in addition to English, at least one of which shall be a modern language, and at least one of which shall be offered in a minimum 4-year sequence in the secondary program (middle level and high school).

(b) World language instruction under subsection (a) may be offered beginning at any grade level, including the elementary grades.

**§ 4.26. ESOL.**

Every school district shall provide a program for each student whose dominant language is not English for the purpose of facilitating the student's achievement of English proficiency and the academic standards under § 4.12 (relating to academic standards). Programs under this section shall include appropriate bilingual-bicultural or English as a second language (ESL) instruction.

**§ 4.27. Physical education and athletics.**

(a) Physical education shall be taught as required under §§ 4.21(e)(5) and (f)(8), 4.22(c)(7) and 4.23(c)(9) (relating to elementary education: primary and intermediate levels; middle level education; and high school education).

(b) The physical education program shall be adapted for students who are unable to participate in the regular physical education program.

(c) The physical education program shall provide co-educational instruction, except that separation by sex may be permitted in courses involving contact sports. Separation by sex may not be used to exclude students of either sex from participating in any physical education instruction.

(d) In addition to physical education instruction under subsections (a)—(c), students of both sexes shall have equal access in interscholastic and intramural athletic programs to all of the following:

- (1) School facilities.
- (2) Coaching and instruction.
- (3) Scheduling of practice time and games.
- (4) Number of activities at each level of competition.
- (5) Equipment, supplies and services.
- (6) Funding appropriate to the sport.

(e) School districts may sponsor coeducational teams in interscholastic and intramural sports programs.

(f) Interscholastic and intramural teams playing contact sports may be separated by sex, but this subsection may not be used to exclude students of either sex from participating in a sport.

**§ 4.28. Special education.**

(a) Under the Individuals with Disabilities Education Act and this part, children with disabilities shall be provided an education which enables them to be involved in and progress in the general curriculum under this chapter.

(b) Students who are gifted as defined in this part shall be provided an education that enables them to participate in acceleration or enrichment, or both, as appropriate.

(c) The educational program provided to children with disabilities shall be in accordance with their Individualized Education Programs under the Individuals with Disabilities Education Act and this part, even if the

Individualized Education Program does not otherwise meet all requirements of this chapter.

(d) Planned instruction for children with disabilities shall conform to the requirements established for planned courses in § 4.3 (relating to definitions) as it relates to planned instruction.

**§ 4.29. HIV/AIDS and other life-threatening and communicable diseases.**

(a) Instruction regarding prevention of human immunodeficiency virus (HIV) infection/acquired immunodeficiency syndrome (AIDS) and other life-threatening and communicable diseases shall be given for primary, intermediate, middle school and high school education and shall follow the requirements of subsections (b) and (c).

(b) Educational materials and instruction shall be determined by the local school district and be appropriate to the age group being taught. The program of instruction shall include information about the nature of the diseases, treatments and cures, methods of transmission and how infection can be prevented. The school district may omit instruction in the elementary grades on transmission of disease through sexual activity. Programs discussing transmission through sexual activity shall stress that abstinence from sexual activity is the only completely reliable means of preventing sexual transmission. Programs shall stress that avoidance of illegal drug use is the only completely reliable means of preventing transmission of disease through shared drug paraphernalia.

(c) A school district, including charter schools, shall excuse a pupil from HIV/AIDS instruction when the instruction conflicts with the religious beliefs or principles of the pupil or parent or guardian of the pupil and when excusal is requested in writing. Prior to the commencement of instruction, a school district shall publicize that detailed curriculum outlines and curricular materials used in conjunction with the instruction are available to parents and guardians during normal school hours or at teacher-parent conferences. Curricular materials, if practical, shall be made available by the school district for home instruction use by a parent or guardian of a student excused from the district's HIV/AIDS instruction.

**VOCATIONAL-TECHNICAL EDUCATION**

**§ 4.31. Vocational-technical education.**

(a) Vocational-technical education courses shall be developed in the planned instruction format and shall be accessible to all high school students attending those grades in which vocational-technical education courses are offered. All students and their parents or guardians shall be informed of the students' rights to participate in vocational-technical education programs and courses.

(b) Vocational-technical education courses may be taught at AVTSs or other high schools.

(c) Vocational-technical education programs shall consist of a series of planned academic and vocational-technical education courses that are articulated with one another so that knowledge and skills are taught in a systematic manner. When appropriate, vocational-technical education programs may also include cooperative vocational-technical education and participation in vocational student organizations to develop leadership skills.

(d) Vocational-technical education courses shall include content based upon occupational analysis, clearly stated

performance objectives deemed critical to successful employment and assessment of student competencies based upon performance standards. In listing planned instruction in its strategic plan under § 4.13 (relating to strategic plans), a school district or AVTS shall indicate which courses meet the requirements of this section.

(e) The record of a student enrolled in a vocational-technical education program shall include the student's educational and occupational objectives and the results of the assessment of student competencies under subsection (d).

(f) Safety education, consisting of safety practices, accident prevention, occupational health habits and environmental concerns shall be integrated into the instruction and practices in vocational-technical education programs.

(g) School districts and AVTSs administering vocational-technical education programs shall develop written policies regarding admissions. Course announcements, guidance materials and other communications shall convey the philosophy of equal access to students considering enrolling in AVTSs and shall include a description of admissions policies. The policies shall assure that when admissions to AVTSs must be limited, the admissions shall be on a nondiscriminatory basis.

#### § 4.32. Standards and reports.

(a) The Secretary is responsible for the promulgation of standards appropriate for implementing § 4.31 (relating to vocational-technical education). Present standards, to the extent that they are inconsistent, are superseded by this chapter.

(b) The Secretary will report annually to the Board on the status of vocational-technical education programs, including tech-prep and apprenticeship programs. Reports will include numbers and types of programs, numbers of students, post-program status of students, Statewide competency standards and assessment information.

#### § 4.33. Advisory committees.

(a) A school district or AVTS administering or planning to administer vocational-technical education programs shall appoint a local advisory committee. Membership on the committee shall consist of business and industry representatives, public sector employers, agriculture, labor organizations, community organizations, postsecondary education institutions and the general public. The appointed advisory committee shall meet at least once each year and shall give advice to the board and the administration concerning the program of the school, including its general philosophy, academic and other standards, strategic plans, course offerings, support services, safety requirements and the skill needs of employers. An advisory committee may serve multiple institutions where employment areas overlap.

(b) An administrative committee, composed of chief school administrators representing participating school districts, shall be included in the organization of each AVTS. The committee shall play an integral part in the development of the AVTS strategic plan under § 4.13 (relating to strategic plans) and advise the AVTS board and the administration concerning the educational program and policies of the school.

(c) An occupational advisory committee shall be established for each vocational-technical education program or cluster of related programs offered by a school district or AVTS. The committee shall meet at least once each year to advise the board, administration and staff on curriculum, equipment, instructional materials, safety require-

ments, program evaluation and other related matters and to verify that the programs meet industry standards and, if appropriate, licensing board criteria and that they prepare students with occupation related competencies.

#### § 4.34. Programs and equipment.

(a) A satellite vocational-technical education program may be operated by an AVTS board in conformity with a memorandum of understanding adopted with the participating school district's board of school directors.

(b) Certified guidance personnel in each secondary school and AVTS shall be assigned responsibility to provide pupils with vocational-technical guidance services.

(c) Equipment will be deemed appropriate if it is compatible, insofar as practical, to that used in occupations or households for which vocational-technical education is provided.

#### § 4.35. AVTSs.

(a) AVTS attendance areas shall conform to the plan of the State Board for Vocational Education. Boards of school directors may petition the State Board for Vocational Education for attendance area assignment or reassignment.

(b) The following provisions apply to the establishment of AVTSs:

(1) Where more than one district constitutes an attendance area, the appropriate intermediate unit may, and upon the request of any school district shall, call for an election by the boards of school directors within the attendance area to determine if an AVTS shall be established.

(2) A school district within the attendance area may elect to participate in the establishment of the AVTS.

(3) Where a single school district constitutes an attendance area, the board of school directors of that district may establish and operate AVTSs and be considered an AVTS board.

(c) The following provisions apply to articles of agreement for the establishment and operation of AVTSs:

(1) The boards of school directors of the school districts electing to participate in the AVTS shall enter into a written agreement setting forth rights and obligations of the participating school districts.

(2) No change will be made in the articles of agreement under paragraph (1) without the consent of each participating school district by the affirmative vote of each board of school directors.

(3) No school district may withdraw from the articles of agreement under paragraph (1) without the consent of each participating school district.

### SCHEDULING AND LEARNING OPTIONS

#### § 4.41. Scheduling.

(a) Kindergarten programs shall provide each kindergarten student with at least 2 1/2 hours of instruction each day for the full school term unless the school district, including charter schools, obtains prior Department approval for an alternative kindergarten program.

(b) A school district, including charter schools, shall obtain approval of the Department prior to scheduling 1/2-day sessions other than in kindergarten under subsection (a).

(c) A school district shall obtain approval of the Department prior to establishing a new school or changing school organization.

(d) Planned instruction offered in summer school may be designed as credit or noncredit offerings.

**§ 4.42. Grade structure.**

This chapter does not require educational programs to be organized in traditional grades according to students' chronological ages or academic achievement levels.

**ASSESSMENT**

**§ 4.51. State assessment system.**

(a) The State assessment system shall be designed to serve the following purposes:

(1) Provide students, parents, educators and citizens with an understanding of student and school performance.

(2) Determine the degree to which school programs enable students to attain proficiency of academic standards under § 4.12 (relating to academic standards).

(3) Provide results to school districts, including charter schools, and AVTSs for consideration in the development of strategic plans under § 4.13 (relating to strategic plans).

(4) Provide information to State policymakers including the General Assembly and the Board on how effective schools are in promoting and demonstrating student proficiency of academic standards.

(5) Provide information to the general public on school performance.

(6) Provide results to school districts, including charter schools, and AVTSs based upon the aggregate performance of all students, for students with an Individualized Education Program (IEP) and for those without an IEP.

(b) All State assessment instruments will be standards-based and criterion referenced and include essay or open-ended response items in addition to other item formats. The proportion of type of items will vary by grade level. Neither State assessments nor academic standards under § 4.12 shall require students to hold or express particular attitudes, values or beliefs. The Department will make samples of assessment questions, instrument formats, and scoring guides available to the public after each administration of State assessments. The criteria for judging performance on State assessments are as follows:

(1) Performance on State reading assessments shall be demonstrated by students' responses to comprehension questions about age-appropriate reading passages and by their written responses to in-depth comprehension questions about the passages.

(2) Performance on State mathematics assessments shall be demonstrated by students' responses to questions about grade-appropriate content and by the quality of their responses to questions which require a written solution to a problem.

(3) Performance on State writing assessments shall be demonstrated by the quality of students' written compositions on a variety of topics and modes of writing.

(4) Levels of proficiency shall be advanced, proficient, basic and below basic. In consultation with educators, students, parents and citizens, the Department will develop and recommend to the Board for its approval specific criteria for advanced, proficient, basic and below basic levels of performance.

(c) The Department will develop or cause to be developed State assessments based on academic standards in mathematics, reading and writing under § 4.12 and contained in Appendix A. In developing assessments, the Department will consult with educators, students, parents and citizens regarding the specific methods of assessment. To ensure that information regarding student performance is available to parents and teachers, State assessments developed under this section shall include student names. Individual test results shall be used in planning instruction only by parents, teachers, administrators and guidance counselors with a need to know based upon local board policy on testing and in reporting academic progress. The Department or other Commonwealth entities are prohibited from collecting individual student test scores, and may only collect aggregate test scores by school and district.

(d) The State assessments shall be administered annually and shall include assessments of the State academic standards in mathematics and reading at grades 5, 8 and 11 and in writing at grades 6, 9 and 11. The purpose of State assessments administered in 1999 is to validate assessment instruments and to provide initial information to teachers and schools to guide the redesign of curricula and instructional strategies to enable students to achieve academic standards.

(e) Students not achieving at the proficient level in the administration of State assessments in grade 11 shall be provided one additional opportunity in grade 12 to demonstrate a proficient level on State assessments.

(f) Expansion of the State assessment system will be authorized by the Board through a revision of this chapter.

(g) The Department will implement provisions for security of the State assessment system, including the following provisions:

(1) Action by a professional employe or commissioned officer which is willfully designed to divulge test questions, falsify student scores or in some other fashion compromise the integrity of the State assessment system as determined by the school district shall be subject to disciplinary action under sections 1259—1267 of the School Code (24 P. S. §§ 12-1259—12-1267).

(2) Cheating by students or employes other than those covered in paragraph (1) shall be subject to disciplinary action by the school district.

(3) Cheating or breaches of assessment security shall be reported to the Secretary as soon as detected.

(h) The Secretary has the authority to establish guidelines for the administration of the State assessment system.

(i) The Secretary will report each September to the Board and the General Assembly information and pertinent data relating to the State assessment system. The Secretary will also provide each school district (including charter schools) and AVTS information and pertinent data for the school district or AVTS and its students.

(j) Children with disabilities shall be included in the State assessment system, with appropriate accommodations, where necessary. As appropriate, the Commonwealth will develop guidelines for the participation of children with disabilities in alternate assessments for those children who cannot participate in the State assessment as determined by each child's Individualized Education Program team under the Individuals with Disabilities Education Act and this part.

**§ 4.52. Local assessment system.**

(a) Each school district, including charter schools, and AVTS shall design an assessment system to do the following:

(1) Determine the degree to which students are achieving academic standards under §§ 4.12 and 4.13(c)(3) (relating to academic standards; and strategic plans). The school district (including charter schools) or AVTS shall provide assistance to students not attaining academic standards at the proficient level or better and the assistance to be provided shall be indicated in the strategic plan under § 4.13.

(2) Use assessment results to improve curriculum and instructional practices, to guide instructional strategies and to develop future strategic plans under § 4.13.

(3) Provide information requested by the Department regarding the achievement of academic standards, which does not include student names, identification numbers or individually identifiable information.

(4) Provide summary information including results of assessments under § 4.52 (relating to local assessment system) to the general public regarding the achievement of students, which does not include student names, identification numbers or individually identifiable information.

(b) The local assessment system shall be implemented no later than 1 year after its strategic plan or revision is approved by the board of school directors under § 4.13.

(c) The local assessment system shall be described in the district's (including charter schools) or AVTS's strategic plan under § 4.13(b)(5).

(d) The local assessment system shall be designed to include a variety of assessment strategies which may include the following:

- (1) Written work by students.
  - (2) Scientific experiments conducted by students.
  - (3) Works of art or musical, theatrical or dance performances by students.
  - (4) Other demonstrations, performances, products or projects by students related to specific academic standards.
  - (5) Examinations developed by teachers to assess specific academic standards.
  - (6) Nationally-available achievement tests.
  - (7) Diagnostic assessments.
  - (8) Evaluations of portfolios of student work related to achievement of academic standards.
  - (9) Other measures as appropriate, which may include standardized tests.
- (f) Individual test information shall be maintained in a student's educational record in a manner consistent with section 438 of the Family Educational Rights and Privacy Act of 1974 (20 U.S.C.A § 1232g) and 34 CFR Part 99 (relating to family educational rights and privacy).

(g) Children with disabilities shall be included in the local assessment system, with appropriate accommodations, when necessary. As appropriate, the school district, including charter schools, or AVTS shall develop guidelines for the participation of children with disabilities in alternate assessments for those children who cannot participate in the local assessment as determined by each

child's Individualized Education Program team under the Individuals with Disabilities Education Act and this part.

**SCHOOL PROFILES****§ 4.61. School profiles.**

(a) School profiles developed by the Secretary will include the following information, in addition to other information the Secretary deems appropriate:

(1) Results of State assessments under § 4.51 (relating to State assessment system).

(2) Results of local assessments under § 4.52 (relating to local assessment system), which may not include student names, identification numbers or individually identifiable information.

(3) School performance improvement goals based on State assessment results under § 4.13 (relating to strategic plans).

(4) Class size.

(5) Information about the instructional program.

(6) Percentages of students who graduate or who drop out and the status of graduates the year after they leave high school.

(7) Student attendance.

(8) Teacher attendance.

(9) Information about fiscal support of the school, school district or AVTS.

(b) In compiling school profiles under this chapter, the Department will provide school entities interpretive information to assist in using the profiles for strategic planning under § 4.13.

(c) The Secretary will prescribe procedures for reporting State assessment data to schools and communities.

(d) The Secretary will make available to the public, and report to the public with the same frequency and in the same detail as for children who are nondisabled, all data as required under the Individuals with Disabilities Education Act.

**PROVISIONS RELATING TO OTHER THAN PUBLIC SCHOOLS****§ 4.71. Certification by principal of nonpublic nonlicensed school.**

(a) Elementary or secondary nonpublic nonlicensed schools, shall, within 30 days of beginning classes, file a notarized certificate with the Secretary as required by section 1327(b)(1) and (2) of the School Code (24 P. S. § 13-1327(b)(1) and (2)) in the form prescribed by the Secretary.

**§ 4.72. Credentials other than the high school diploma.**

The requirements for a Commonwealth secondary school diploma are as follows:

(1) The Commonwealth secondary school diploma may be issued to an applicant who is a resident of this Commonwealth and does not possess a secondary school diploma upon presentation of evidence of full matriculation and the satisfactory completion of a minimum of 1 full year or 30 semester hours of study at an accredited institution of postsecondary education.

(2) In addition to the provisions of paragraph (1), the Commonwealth secondary school diploma may be issued to an applicant who is a resident of this Commonwealth, does not possess a secondary school diploma and is not

enrolled in a public, licensed private, registered accredited or licensed nonpublic secondary school upon earning a passing score as determined by the Department on the high school level tests of General Educational Development (GED). A person 18 years of age or older may qualify for GED testing upon request. A person between 16 and 18 years of age may qualify for GED testing upon the issuance of a court order or at the written request of one of the following:

- (i) An employer who requires a high school equivalency credential for job opportunities.
- (ii) An official of an accredited institution of postsecondary education which accepts applicants on the basis of GED test scores.
- (iii) A recruiting officer of a branch of the armed forces that requires a high school equivalency credential for entry of new recruits.
- (iv) The director of a State institution on behalf of residents, patients or inmates.

(3) The Department will not ordinarily issue a diploma until after the high school class of which the applicant was a member has been graduated. This restriction may be waived by the Department upon the recommendation of the school district for persons between 16 and 18 years of age who meet the higher education or GED requirements for the secondary school diploma.

**§ 4.73. Correspondence schools.**

An applicant 18 years of age or older will be issued a Certificate of Preliminary Education upon presentation to the Department of evidence of the issuance of a high school diploma by an accredited private correspondence school licensed or approved by the State Board of Private Licensed Schools.

**§ 4.74. Students in special situations.**

- (a) A foreign student without educational credentials may earn the Commonwealth secondary school diploma by meeting the requirements under § 4.72 (relating to credentials other than the high school diploma).
- (b) A graduate of a secondary school in another state which is not on an approved list of secondary schools may earn an appropriate credential by passing an examination administered by the education agency of that state or by its designee or by meeting the requirements for the Commonwealth secondary school diploma under § 4.72.
- (c) Credit granted by a public school in this Commonwealth shall be accepted by all public schools and institutions in this Commonwealth upon the transfer of a student.

**ENFORCEMENT AND IMPLEMENTATION**

**§ 4.81. Allegations of deficiencies.**

- (a) The Secretary will receive and investigate allegations of curriculum deficiencies from professional employees, commissioned officers, parents of students or other residents of a school district or AVTS.
- (b) The Secretary will notify the school district or AVTS superintendent of allegations and may require the superintendent to submit one or more of the following:

- (1) Relevant descriptions of planned instruction.
- (2) A series of written articulated courses of instructional units.
- (3) Relevant student assessment information.
- (4) Information on staff assignments.
- (5) Other information pertinent to investigating a specific allegation.
- (c) If the Secretary determines that a curriculum deficiency exists, the school district or AVTS shall be required to submit to the Secretary for approval a plan to correct the deficiency.
- (d) Within 1 year of the implementation of a corrective action plan under subsection (c), the Secretary will review the actions taken to correct the deficiency. If the deficiency remains uncorrected, the Secretary will send a formal notice of deficiency to the school district or AVTS board of school directors, and the notice shall be announced at the school board meeting immediately following its receipt.
- (e) If the school district or AVTS does not take appropriate actions to correct the deficiency after the notice of deficiency is announced, the Secretary will take action under State law.

**§ 4.82. Exceptions.**

- (a) The Secretary may grant exceptions to specific provisions of this chapter when it is necessary to adapt them to the curriculum needs of individual school districts or AVTSs or to facilitate transition to the revised provisions of this chapter. Specific exception may be made for school districts (including charter schools) and AVTSs which develop or implement academic standards that are comparable to or exceed those found in § 4.12 (relating to academic standards). Exceptions may be granted under the following conditions:
  - (1) The request for an exception shall be in writing and shall include relevant information supporting the need for the exception.
  - (2) The exception shall be valid for a limited term not to exceed 2 years.
  - (3) The request shall be made prior to initiating the action requiring approval and shall have the prior approval of the board of school directors.
- (b) The Secretary will report annually to the Board on the nature and status of requests for exceptions under this section.

**§ 4.83. Implementation schedule.**

- (a) The strategic plans under § 4.13 (relating to strategic plans) shall be developed by a schedule to be determined by the Department. Plans addressing the requirements of this chapter shall be on file with the Department by September 30, 2002.
- (b) In the school year in which a school district (including charter schools) or AVTS submits its initial strategic plan under § 4.13, it shall implement professional development, curriculum development and assessment development activities identified in the strategic plan and shall receive technical assistance from the Department.

APPENDIX A

Academic Standards for Reading, Writing, Speaking and Listening

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**THE ACADEMIC STANDARDS**

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II. INTRODUCTION

This document includes Reading, Writing, Speaking and Listening Standards:

- 1.1. Learning to Read Independently
- 1.2. Reading Critically in All Content Areas
- 1.3. Reading, Analyzing and Interpreting Literature
- 1.4. Types of Writing
- 1.5. Quality of Writing
- 1.6. Speaking and Listening
- 1.7. Characteristics and Function of the English Language
- 1.8. Research

The Reading, Writing, Speaking and Listening Standards describe what students should know and be able to do with the English Language at four grade levels (third, fifth, eighth and eleventh). The standards provide the targets for instruction and student learning essential for success in all academic areas, not just language arts classrooms. Although the standards are not a curriculum or a prescribed series of activities, school entities will use them to develop a local school curriculum that will meet local students' needs.

The language arts—Reading, Writing, Speaking and Listening—are unique because they are processes that students use to learn and make sense of their world. Students do not read “reading”; they read about history, science, mathematics and other content areas as well as about topics for their interest and entertainment. Similarly, students do not write “writing”; they use written words to express their knowledge and ideas and to inform or entertain others.

Because of the unique nature of the language arts, all teachers in a school will use the Reading, Writing, Speaking and Listening Standards. The standards define the skills and strategies employed by effective readers and writers; therefore, all teachers will assist their students in learning them through multiple classroom situations in all the subject areas.

The Reading, Writing, Speaking and Listening standards also provide parents and community members with information about what students should know and be able to do as they progress through the educational program and at graduation. With a clearly defined target provided by the standards, parents, students, educators and community members become partners in learning success.

A glossary is included to assist the reader in understanding terminology contained in the standards.

1.1. Learning to Read Independently			
1.1.3. GRADE 3	1.1.5. GRADE 5	1.1.8. GRADE 8	1.1.11. GRADE 11
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
A. Identify the purposes and types of text (e.g., literature, information) before reading.	A. Establish the purpose for reading a type of text (literature, information) before reading.	A. Locate appropriate texts (literature, information, documents) for an assigned purpose before reading.	A. Locate various texts, media and traditional resources for assigned and independent projects before reading.



<b>1.1. Learning to Read Independently</b>			
<b>1.1.3. GRADE 3</b>	<b>1.1.5. GRADE 5</b>	<b>1.1.8. GRADE 8</b>	<b>1.1.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>B. Preview the text formats (e.g., title, headings, chapters, and table of contents).</p> <p>C. Use knowledge of phonics, word analysis (e.g., root words, prefixes and suffixes), syllabication, picture and context clues to decode and understand new words during reading.</p> <p>D. Read text using self-monitoring comprehension strategies (e.g., predict, revise predictions, reread, use text organization headings, graphics, charts, and adjust reading rate).</p> <p>E. Acquire a reading vocabulary by identifying and correctly using words, (e.g. antonyms, synonyms, categories of words). Use a dictionary when appropriate.</p> <p>F. Understand the meaning of and use correctly new vocabulary learned in various subject areas.</p>	<p>B. Select texts for a particular purpose using the format of the text as a guide.</p> <p>C. Use knowledge of phonics, syllabication, prefixes, suffixes, the dictionary or context clues to decode and understand new words during reading. Use these words accurately in writing and speaking.</p> <p>D. Identify the basic ideas and facts in text using strategies (e.g., prior knowledge, illustrations and headings) and information from other sources to make predictions about text.</p> <p>E. Acquire a reading vocabulary by correctly identifying and using words (e.g., synonyms, homophones and homographs and words with roots, suffixes, and/or prefixes). Use a dictionary or related reference.</p> <p>F. Identify, understand the meaning of and use correctly key vocabulary from various subject areas.</p>	<p>B. Identify and use common organizational structures and graphic features to comprehend information.</p> <p>C. Use knowledge of root words as well as context clues and glossaries to understand specialized vocabulary in the content areas during reading. Use these words accurately in speaking and writing.</p> <p>D. Identify basic facts and ideas in text using specific strategies (e.g., recall genre characteristics, set a purpose for reading, generate essential questions as aids to comprehension and clarify understanding through rereading and discussion).</p> <p>E. Expand a reading vocabulary by identifying and correctly using idioms and words with literal and figurative meanings. Use a dictionary or related reference.</p> <p>F. Understand the meaning of and apply key vocabulary across the various subject areas.</p>	<p>B. Analyze the structure of informational materials explaining how authors used these to achieve their purposes.</p> <p>C. Use knowledge of root words and words from literary works to recognize and understand the meaning of new words during reading. Use these words accurately in speaking and writing.</p> <p>D. Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.</p> <p>E. Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.</p> <p>F. Understand the meaning of and apply key vocabulary across the various subject areas.</p>

<b>1.1. Learning to Read Independently</b>			
<b>1.1.3. GRADE 3</b>	<b>1.1.5. GRADE 5</b>	<b>1.1.8. GRADE 8</b>	<b>1.1.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>G. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text.</p> <ul style="list-style-type: none"> <li>Retell or summarize the major ideas, themes or procedures of the text.</li> <li>Connect the new information or ideas in the text to known information.</li> <li>Clarify ideas and understandings through rereading and discussion.</li> <li>Make responsible assertions about the text by citing evidence from the text.</li> </ul>	<p>G. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text.</p> <ul style="list-style-type: none"> <li>Summarize the major ideas, themes or procedures of the text.</li> <li>Relate new information or ideas from the text to that learned through additional reading and media (e.g., films, audiotapes).</li> <li>Clarify ideas and understandings through rereading and discussion.</li> <li>Make responsible assertions about the ideas from the text by citing evidence.</li> <li>Extend ideas found in the text.</li> </ul>	<p>G. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents.</p> <ul style="list-style-type: none"> <li>Make, and support with evidence, assertions about texts.</li> <li>Compare and contrast texts using themes, settings, characters and ideas.</li> <li>Make extensions to related ideas, topics or information.</li> <li>Describe the context of a document.</li> <li>Analyze the positions, arguments and evidence in public documents.</li> </ul>	<p>G. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents.</p> <ul style="list-style-type: none"> <li>Make, and support with evidence, assertions about texts.</li> <li>Compare and contrast texts using themes, settings, characters and ideas.</li> <li>Make extensions to related ideas, topics or information.</li> <li>Assess the validity of the document based on context.</li> <li>Analyze the positions, arguments and evidence in public documents.</li> <li>Evaluate the strategies of the author.</li> <li>Critique public documents to identify strategies common in public discourse.</li> </ul>
<p>H. Demonstrate fluency and comprehension in reading.</p> <ul style="list-style-type: none"> <li>Read familiar materials aloud with accuracy.</li> <li>Self-correct mistakes.</li> <li>Use appropriate rhythm, flow, meter and pronunciation.</li> <li>Read a variety of genres and types of text.</li> <li>Demonstrate comprehension (Standard 1.1.3.G.).</li> </ul> <p>(Recommend: 25 books/year)</p>	<p>H. Demonstrate fluency and comprehension in reading.</p> <ul style="list-style-type: none"> <li>Read familiar materials aloud with accuracy.</li> <li>Self-correct mistakes.</li> <li>Use appropriate rhythm, flow, meter and pronunciation.</li> <li>Read a variety of genres and types of text.</li> <li>Demonstrate comprehension (Standard 1.1.5.G.).</li> </ul> <p>(Recommend: 25 books/year)</p>	<p>H. Demonstrate fluency and comprehension in reading.</p> <ul style="list-style-type: none"> <li>Read familiar materials aloud with accuracy.</li> <li>Self-correct mistakes.</li> <li>Use appropriate rhythm, flow, meter and pronunciation.</li> <li>Read a variety of genres and types of text.</li> <li>Demonstrate comprehension (Standard 1.1.8.G.).</li> </ul> <p>(Recommend: 25 books/year)</p>	<p>H. Demonstrate fluency and comprehension in reading.</p> <ul style="list-style-type: none"> <li>Read familiar materials aloud with accuracy.</li> <li>Self-correct mistakes.</li> <li>Use appropriate rhythm, flow, meter and pronunciation.</li> <li>Read a variety of genres and types of text.</li> <li>Demonstrate comprehension (Standard 1.1.11.G.).</li> </ul> <p>(Recommend: 25 books/year)</p>

<b>1.2. Reading Critically in All Content Areas</b>			
<b>1.2.3. GRADE 3</b>	<b>1.2.5. GRADE 5</b>	<b>1.2.8. GRADE 8</b>	<b>1.2.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Read and understand essential content of informational texts and documents in all academic areas.</p> <ul style="list-style-type: none"> <li>• Differentiate fact from opinion within text.</li> <li>• Distinguish between essential and nonessential information within a text.</li> <li>• Make inferences from text when studying a topic (e.g., science, social studies) and draw conclusions based on text.</li> <li>• Analyze text organization and content to derive meaning from text using established criteria.</li> </ul> <p>B. Use and understand a variety of media and evaluate the quality of material produced.</p> <ul style="list-style-type: none"> <li>• Use electronic media for research.</li> <li>• Identify techniques used in television and use the knowledge to distinguish between facts and misleading information.</li> <li>• Assess the quality of media project (e.g., script, play, audiotape) that has been developed for a targeted audience.</li> </ul> <p>C. Produce work in at least one literary genre that follows the conventions of the genre.</p>	<p>A. Read and understand essential content of informational texts and documents in all academic areas.</p> <ul style="list-style-type: none"> <li>• Differentiate fact from opinion across texts.</li> <li>• Distinguish between essential and nonessential information across a variety of texts, identifying stereotypes and exaggeration where present.</li> <li>• Make inferences about similar concepts in multiple texts and draw conclusions.</li> <li>• Evaluate text organization and content to determine the author's purpose and effectiveness.</li> </ul> <p>B. Use and understand a variety of media and evaluate the quality of material produced.</p> <ul style="list-style-type: none"> <li>• Use a variety of media (e.g., computerized card catalogues, encyclopedias) for research.</li> <li>• Evaluate the role of media as a source of both entertainment and information.</li> <li>• Use established criteria to design and develop media project (e.g., script, play, audiotape) for a targeted audience.</li> </ul> <p>C. Produce work in at least one literary genre that follows the conventions of the genre.</p>	<p>A. Read and understand essential content of informational texts and documents in all academic areas.</p> <ul style="list-style-type: none"> <li>• Differentiate fact from opinion utilizing resources that go beyond traditional text (e.g., newspapers, magazines and periodicals) to electronic media.</li> <li>• Distinguish between essential and nonessential information across texts and going beyond texts to a variety of media; identify bias and propaganda where present.</li> <li>• Draw inferences based on a variety of information sources.</li> <li>• Evaluate text organization and content to determine the author's purpose and effectiveness according to the author's theses, accuracy, and thoroughness.</li> </ul> <p>B. Use and understand a variety of media and evaluate the quality of material produced.</p> <ul style="list-style-type: none"> <li>• Compare and analyze how different media offer a unique perspective on the information presented.</li> <li>• Analyze the techniques of particular media messages and their effect on a targeted audience.</li> <li>• Use, design and develop a media project that expands understanding (e.g., authors and works from a particular historical period).</li> </ul> <p>C. Produce work in at least one literary genre that follows the conventions of the genre.</p>	<p>A. Read and understand essential content of informational texts and documents in all academic areas.</p> <ul style="list-style-type: none"> <li>• Differentiate fact from opinion across a variety of texts, by using complete and accurate information, coherent arguments and points of view.</li> <li>• Distinguish between essential and nonessential information across a variety of sources, identifying the use of proper references or authorities and propaganda techniques where present.</li> <li>• Use teacher and student established criteria for making decisions and drawing conclusions.</li> <li>• Evaluate text organization and content to determine the author's purpose and effectiveness according to the author's theses, accuracy, thoroughness, logic and reasoning.</li> </ul> <p>B. Use and understand a variety of media and evaluate the quality of material produced.</p> <ul style="list-style-type: none"> <li>• Select appropriate electronic media for research and evaluate the quality of the information received.</li> <li>• Explain how the techniques used in electronic media modify traditional forms of discourse for different purposes.</li> <li>• Use, design and develop a media project to demonstrate understanding (e.g., a major writer or literary period or movement).</li> </ul> <p>C. Produce work in at least one literary genre that follows the conventions of the genre.</p>

<b>1.3. Reading, Analyzing and Interpreting Literature</b>			
<b>1.3.3. GRADE 3</b>	<b>1.3.5. GRADE 5</b>	<b>1.3.8. GRADE 8</b>	<b>1.3.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Read and understand works of literature.</p> <p>B. Identify literary elements in stories describing characters, setting and plot.</p> <p>C. Identify literary devices in stories. (e.g., rhyme, rhythm, personification).</p> <p>D. Identify the structures in poetry (e.g., pattern books, predictable books nursery rhymes).</p> <p>E. Identify the structures in drama (e.g., dialogue, story enactment, acts, scenes).</p> <p>F. Read and respond to nonfiction and fiction including poetry and drama.</p>	<p>A. Read and understand works of literature.</p> <p>B. Compare the use of literary elements within and among texts, including characters, setting, plot, theme, and point of view.</p> <p>C. Describe how the author uses literary devices to convey meaning. <ul style="list-style-type: none"> <li>• Sound techniques (e.g., rhyme, rhythm, meter, alliteration)</li> <li>• Figurative language (e.g., personification, simile, metaphor, hyperbole).</li> </ul> </p> <p>D. Identify and respond to the effects of sound and structure in poetry (e.g., alliteration, rhyme, verse form).</p> <p>E. Analyze drama as information source, entertainment, persuasion or transmitter of culture.</p> <p>F. Read and respond to nonfiction and fiction including poetry and drama.</p>	<p>A. Read and understand works of literature.</p> <p>B. Analyze the use of literary elements by an author including characterization, setting, plot, theme, point of view, tone, and style.</p> <p>C. Analyze the effect of various literary devices. <ul style="list-style-type: none"> <li>• Sound techniques (e.g., rhyme, rhythm, meter, alliteration)</li> <li>• Figurative language (e.g., personification, simile, metaphor, hyperbole, allusion).</li> </ul> </p> <p>D. Identify poetic forms (e.g., ballad, sonnet, couplet).</p> <p>E. Analyze drama to determine the reasons for a character's actions taking into account the situation and basic motivation of the character.</p> <p>F. Read and respond to nonfiction and fiction including poetry and drama.</p>	<p>A. Read and understand works of literature.</p> <p>B. Analyze the relationships, uses and effectiveness of literary elements used by one or more authors in similar genres including characterization, setting, plot, theme, point of view, tone, and style.</p> <p>C. Analyze the effectiveness, in terms of literary quality, of the author's use of literary devices. <ul style="list-style-type: none"> <li>• Sound techniques (e.g., rhyme, rhythm, meter, alliteration)</li> <li>• Figurative language (e.g., personification, simile, metaphor, hyperbole, irony, satire)</li> <li>• Literary structures (e.g., foreshadowing, flashbacks, progressive and digressive time).</li> </ul> </p> <p>D. Analyze and evaluate in poetry the appropriateness of diction and figurative language (e.g., irony, understatement, overstatement, paradox).</p> <p>E. Analyze how a scriptwriter's use of words creates tone and mood, and how choice of words advances the theme or purpose of the work.</p> <p>F. Read and respond to nonfiction and fiction including poetry and drama.</p>

<b>1.4. Types of Writing</b>			
<b>1.4.3. GRADE 3</b>	<b>1.4.5. GRADE 5</b>	<b>1.4.8. GRADE 8</b>	<b>1.4.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Write narrative pieces (e.g., stories, poems, plays).</p> <ul style="list-style-type: none"> <li>• Include detailed descriptions of people, places and things.</li> <li>• Use relevant illustrations.</li> <li>• Include literary elements (Standard 1.3.3.B.).</li> </ul> <p>B. Write informational pieces (e.g., descriptions, letters, reports, instructions) using illustrations when relevant.</p> <p>C. Write an opinion and support it with facts.</p>	<p>A. Write poems, plays and multi-paragraph stories.</p> <ul style="list-style-type: none"> <li>• Include detailed descriptions of people, places and things.</li> <li>• Use relevant illustrations.</li> <li>• Utilize dialogue.</li> <li>• Apply literary conflict.</li> <li>• Include literary elements (Standard 1.3.5.B).</li> <li>• Use literary devices (Standard 1.3.5.C.).</li> </ul> <p>B. Write multi-paragraph informational pieces (e.g., essays, descriptions, letters, reports, instructions).</p> <ul style="list-style-type: none"> <li>• Include cause and effect.</li> <li>• Develop a problem and solution when appropriate to the topic.</li> <li>• Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs).</li> </ul> <p>C. Write persuasive pieces with a clearly stated position or opinion and supporting detail, citing sources when needed.</p>	<p>A. Write short stories, poems and plays.</p> <ul style="list-style-type: none"> <li>• Apply varying organizational methods.</li> <li>• Use relevant illustrations.</li> <li>• Utilize dialogue.</li> <li>• Apply literary conflict.</li> <li>• Include literary elements (Standard 1.3.8.B.).</li> <li>• Use literary devices (Standard 1.3.8.C.).</li> </ul> <p>B. Write multi-paragraph informational pieces (e.g., letters, descriptions, reports, instructions, essays, articles, interviews).</p> <ul style="list-style-type: none"> <li>• Include cause and effect.</li> <li>• Develop a problem and solution when appropriate to the topic.</li> <li>• Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs).</li> <li>• Use primary and secondary sources.</li> </ul> <p>C. Write persuasive pieces.</p> <ul style="list-style-type: none"> <li>• Include a clearly stated position or opinion.</li> <li>• Include convincing, elaborated and properly cited evidence.</li> <li>• Develop reader interest.</li> <li>• Anticipate and counter reader concerns and arguments.</li> </ul> <p>D. Maintain a written record of activities, course work, experience, honors and interests.</p>	<p>A. Write short stories, poems and plays.</p> <ul style="list-style-type: none"> <li>• Apply varying organizational methods.</li> <li>• Use relevant illustrations.</li> <li>• Utilize dialogue.</li> <li>• Apply literary conflict.</li> <li>• Include varying characteristics (e.g., from limerick to epic, from whimsical to dramatic).</li> <li>• Include literary elements (Standard 1.3.11.B.).</li> <li>• Use literary devices (Standard 1.3.11.C.).</li> </ul> <p>B. Write complex informational pieces (e.g., research papers, analyses, evaluations, essays).</p> <ul style="list-style-type: none"> <li>• Include a variety of methods to develop the main idea.</li> <li>• Use precise language and specific detail.</li> <li>• Include cause and effect.</li> <li>• Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs).</li> <li>• Use primary and secondary sources.</li> </ul> <p>C. Write persuasive pieces.</p> <ul style="list-style-type: none"> <li>• Include a clearly stated position or opinion.</li> <li>• Include convincing, elaborated and properly cited evidence.</li> <li>• Develop reader interest.</li> <li>• Anticipate and counter reader concerns and arguments.</li> <li>• Include a variety of methods to advance the argument or position.</li> </ul> <p>D. Maintain a written record of activities, course work, experience, honors and interests.</p> <p>E. Write a personal résumé.</p>

<b>1.5. Quality of Writing</b>			
<b>1.5.3. GRADE 3</b>	<b>1.5.5. GRADE 5</b>	<b>1.5.8. GRADE 8</b>	<b>1.5.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Write with a sharp, distinct focus identifying topic, task and audience.</p> <p>B. Write using well-developed content appropriate for the topic.</p> <ul style="list-style-type: none"> <li>• Gather and organize information.</li> <li>• Write a series of related sentences or paragraphs with one central idea.</li> <li>• Incorporate details relevant and appropriate to the topic.</li> </ul> <p>C. Write with controlled and/or subtle organization.</p> <ul style="list-style-type: none"> <li>• Sustain a logical order.</li> <li>• Include a recognizable beginning, middle and end.</li> </ul> <p>D. Write with an awareness of the stylistic aspects of composition.</p> <ul style="list-style-type: none"> <li>• Use sentences of differing lengths and complexities.</li> <li>• Use descriptive words and action verbs.</li> </ul> <p>E. Revise writing to improve detail and order by identifying missing information and determining whether ideas follow logically.</p>	<p>A. Write with a sharp, distinct focus identifying topic, task and audience.</p> <p>B. Write using well-developed content appropriate for the topic.</p> <ul style="list-style-type: none"> <li>• Gather, organize and select the most effective information appropriate for the topic, task and audience.</li> <li>• Write paragraphs that have a topic sentence and supporting details.</li> </ul> <p>C. Write with controlled and/or subtle organization.</p> <ul style="list-style-type: none"> <li>• Sustain a logical order within sentences and between paragraphs using meaningful transitions.</li> <li>• Include an identifiable introduction, body and conclusion.</li> </ul> <p>D. Write with an understanding of the stylistic aspects of composition.</p> <ul style="list-style-type: none"> <li>• Use different types and lengths of sentences.</li> <li>• Use precise language including adjectives, adverbs, action verbs and specific details that convey the writer's meaning.</li> <li>• Develop and maintain a consistent voice.</li> </ul> <p>E. Revise writing to improve organization and word choice; check the logic, order of ideas and precision of vocabulary.</p>	<p>A. Write with a sharp, distinct focus.</p> <ul style="list-style-type: none"> <li>• Identify topic, task and audience.</li> <li>• Establish a single point of view.</li> </ul> <p>B. Write using well-developed content appropriate for the topic.</p> <ul style="list-style-type: none"> <li>• Gather, determine validity and reliability of and organize information.</li> <li>• Employ the most effective format for purpose and audience.</li> <li>• Write paragraphs that have details and information specific to the topic and relevant to the focus.</li> </ul> <p>C. Write with controlled and/or subtle organization.</p> <ul style="list-style-type: none"> <li>• Sustain a logical order within sentences and between paragraphs using meaningful transitions.</li> <li>• Establish topic and purpose in the introduction.</li> <li>• Reiterate the topic and purpose in the conclusion.</li> </ul> <p>D. Write with an understanding of the stylistic aspects of composition.</p> <ul style="list-style-type: none"> <li>• Use different types and lengths of sentences.</li> <li>• Use tone and voice through the use of precise language.</li> </ul> <p>E. Revise writing after rethinking logic of organization and rechecking central idea, content, paragraph development, level of detail, style, tone and word choice.</p>	<p>A. Write with a sharp, distinct focus.</p> <ul style="list-style-type: none"> <li>• Identify topic, task and audience.</li> <li>• Establish and maintain a single point of view.</li> </ul> <p>B. Write using well-developed content appropriate for the topic.</p> <ul style="list-style-type: none"> <li>• Gather, determine validity and reliability of, analyze and organize information.</li> <li>• Employ the most effective format for purpose and audience.</li> <li>• Write fully developed paragraphs that have details and information specific to the topic and relevant to the focus.</li> </ul> <p>C. Write with controlled and/or subtle organization.</p> <ul style="list-style-type: none"> <li>• Sustain a logical order throughout the piece.</li> <li>• Include an effective introduction and conclusion.</li> </ul> <p>D. Write with a command of the stylistic aspects of composition.</p> <ul style="list-style-type: none"> <li>• Use different types and lengths of sentences.</li> <li>• Use precise language.</li> </ul> <p>E. Revise writing to improve style, word choice, sentence variety and subtlety of meaning after rethinking how questions of purpose, audience and genre have been addressed.</p>

<b>1.5. Quality of Writing</b>			
<b>1.5.3. GRADE 3</b>	<b>1.5.5. GRADE 5</b>	<b>1.5.8. GRADE 8</b>	<b>1.5.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>F. Edit writing using the conventions of language.</p> <ul style="list-style-type: none"> <li>• Spell common, frequently used words correctly.</li> <li>• Use capital letters correctly (first word in sentences, proper nouns, pronoun "I").</li> <li>• Punctuate correctly (periods, exclamation points, question marks, commas in a series).</li> <li>• Use nouns, pronouns, verbs, adjectives, adverbs and conjunctions properly.</li> <li>• Use complete sentences (simple, compound, declarative, interrogative, exclamatory and imperative).</li> </ul> <p>G. Present and/or defend written work for publication when appropriate.</p>	<p>F. Edit writing using the conventions of language.</p> <ul style="list-style-type: none"> <li>• Spell common, frequently used words correctly.</li> <li>• Use capital letters correctly</li> <li>• Punctuate correctly (periods, exclamation points, question marks, commas, quotation marks, apostrophes).</li> <li>• Use nouns, pronouns, verbs, adjectives, adverbs, conjunctions, prepositions and interjections properly.</li> <li>• Use complete sentences (simple, compound, declarative, interrogative, exclamatory and imperative).</li> </ul> <p>G. Present and/or defend written work for publication when appropriate.</p>	<p>F. Edit writing using the conventions of language.</p> <ul style="list-style-type: none"> <li>• Spell common, frequently used words correctly.</li> <li>• Use capital letters correctly.</li> <li>• Punctuate correctly (periods, exclamation points, question marks, commas, quotation marks, apostrophes, colons, semicolons, parentheses).</li> <li>• Use nouns, pronouns, verbs, adjectives, adverbs, conjunctions prepositions and interjections properly.</li> <li>• Use complete sentences (simple, compound, complex, declarative, interrogative, exclamatory and imperative).</li> </ul> <p>G. Present and/or defend written work for publication when appropriate.</p>	<p>F. Edit writing using the conventions of language.</p> <ul style="list-style-type: none"> <li>• Spell all words correctly.</li> <li>• Use capital letters correctly.</li> <li>• Punctuate correctly (periods, exclamation points, question marks, commas, quotation marks, apostrophes, colons, semicolons, parentheses, hyphens, brackets, ellipses).</li> <li>• Use nouns, pronouns, verbs, adjectives, adverbs, conjunctions, prepositions and interjections properly.</li> <li>• Use complete sentences (simple, compound, complex, declarative, interrogative, exclamatory and imperative).</li> </ul> <p>G. Present and/or defend written work for publication when appropriate.</p>

<b>1.6. Speaking and Listening</b>			
<b>1.6.3. GRADE 3</b>	<b>1.6.5. GRADE 5</b>	<b>1.6.8. GRADE 8</b>	<b>1.6.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Listen to others.</p> <ul style="list-style-type: none"> <li>• Ask questions as an aid to understanding.</li> <li>• Distinguish fact from opinion.</li> </ul>	<p>A. Listen to others.</p> <ul style="list-style-type: none"> <li>• Ask pertinent questions.</li> <li>• Distinguish relevant information, ideas and opinions from those that are irrelevant.</li> <li>• Take notes when prompted.</li> </ul>	<p>A. Listen to others.</p> <ul style="list-style-type: none"> <li>• Ask probing questions.</li> <li>• Analyze information, ideas and opinions to determine relevancy.</li> <li>• Take notes when needed.</li> </ul>	<p>A. Listen to others.</p> <ul style="list-style-type: none"> <li>• Ask clarifying questions.</li> <li>• Synthesize information, ideas and opinions to determine relevancy.</li> <li>• Take notes.</li> </ul>

<b>1.6. Speaking and Listening</b>			
<b>1.6.3. GRADE 3</b>	<b>1.6.5. GRADE 5</b>	<b>1.6.8. GRADE 8</b>	<b>1.6.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>B. Listen to a selection of literature (fiction and/or nonfiction).</p> <ul style="list-style-type: none"> <li>• Relate it to similar experiences.</li> <li>• Predict what will happen next.</li> <li>• Retell a story in chronological order.</li> <li>• Recognize character and tone.</li> <li>• Identify and define new words and concepts.</li> </ul> <p>C. Speak using skills appropriate to formal speech situations.</p> <ul style="list-style-type: none"> <li>• Use appropriate volume.</li> <li>• Pronounce most words accurately.</li> <li>• Pace speech so that it is understandable.</li> <li>• Demonstrate an awareness of audience.</li> </ul> <p>D. Contribute to discussions.</p> <ul style="list-style-type: none"> <li>• Ask relevant questions.</li> <li>• Respond with appropriate information or opinions to questions asked.</li> <li>• Listen to and acknowledge the contributions of others.</li> <li>• Display appropriate turn-taking behaviors.</li> </ul>	<p>B. Listen to a selection of literature (fiction and/or nonfiction).</p> <ul style="list-style-type: none"> <li>• Relate it to what is known.</li> <li>• Predict the result of the story actions.</li> <li>• Retell actions of the story in sequence, explain the theme and describe the characters and setting.</li> <li>• Identify and define new words and concepts.</li> <li>• Summarize the selection.</li> </ul> <p>C. Speak using skills appropriate to formal speech situations.</p> <ul style="list-style-type: none"> <li>• Use complete sentences.</li> <li>• Pronounce words correctly.</li> <li>• Use appropriate volume.</li> <li>• Pace speech so that it is understandable.</li> <li>• Adjust content for different audiences (e.g., fellow classmates, parents).</li> <li>• Speak with a purpose in mind.</li> </ul> <p>D. Contribute to discussions.</p> <ul style="list-style-type: none"> <li>• Ask relevant questions.</li> <li>• Respond with relevant information or opinions to questions asked.</li> <li>• Listen to and acknowledge the contributions of others.</li> <li>• Adjust involvement to encourage equitable participation.</li> <li>• Give reasons for opinions.</li> <li>• Summarize, when prompted.</li> </ul>	<p>B. Listen to selections of literature (fiction and/or nonfiction).</p> <ul style="list-style-type: none"> <li>• Relate them to previous knowledge.</li> <li>• Predict content/events.</li> <li>• Summarize events and identify the significant points.</li> <li>• Identify and define new words and concepts.</li> <li>• Analyze the selections.</li> </ul> <p>C. Speak using skills appropriate to formal speech situations.</p> <ul style="list-style-type: none"> <li>• Use complete sentences.</li> <li>• Pronounce words correctly.</li> <li>• Adjust volume to purpose and audience.</li> <li>• Adjust pace to convey meaning.</li> <li>• Add stress (emphasis) and inflection to enhance meaning.</li> </ul> <p>D. Contribute to discussions.</p> <ul style="list-style-type: none"> <li>• Ask relevant, probing questions.</li> <li>• Respond with relevant information, ideas or reasons in support of opinions expressed.</li> <li>• Listen to and acknowledge the contributions of others.</li> <li>• Adjust tone and involvement to encourage equitable participation.</li> <li>• Clarify, illustrate or expand on a response when asked.</li> <li>• Present support for opinions.</li> <li>• Paraphrase and summarize, when prompted.</li> </ul>	<p>B. Listen to selections of literature (fiction and/or nonfiction).</p> <ul style="list-style-type: none"> <li>• Relate them to previous knowledge.</li> <li>• Predict solutions to identified problems.</li> <li>• Summarize and reflect on what has been heard.</li> <li>• Identify and define new words and concepts.</li> <li>• Analyze and synthesize the selections relating them to other selections heard or read.</li> </ul> <p>C. Speak using skills appropriate to formal speech situations.</p> <ul style="list-style-type: none"> <li>• Use a variety of sentence structures to add interest to a presentation.</li> <li>• Pace the presentation according to audience and purpose.</li> <li>• Adjust stress, volume, and inflection to provide emphasis to ideas or to influence the audience.</li> </ul> <p>D. Contribute to discussions.</p> <ul style="list-style-type: none"> <li>• Ask relevant, clarifying questions.</li> <li>• Respond with relevant information or opinions to questions asked.</li> <li>• Listen to and acknowledge the contributions of others.</li> <li>• Adjust tone and involvement to encourage equitable participation.</li> <li>• Facilitate total group participation.</li> <li>• Introduce relevant, facilitating information, ideas and opinions to enrich the discussion.</li> <li>• Paraphrase and summarize as needed.</li> </ul>



<b>1.6. Speaking and Listening</b>			
<b>1.6.3. GRADE 3</b>	<b>1.6.5. GRADE 5</b>	<b>1.6.8. GRADE 8</b>	<b>1.6.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>E. Participate in small and large group discussions and presentations.</p> <ul style="list-style-type: none"> <li>• Participate in everyday conversation.</li> <li>• Present oral readings.</li> <li>• Deliver short reports (e.g., Show-and-Tell, field trip summary).</li> <li>• Conduct short interviews.</li> <li>• Give simple directions and explanations.</li> <li>• Report an emergency.</li> </ul> <p>F. Use media for learning purposes.</p> <ul style="list-style-type: none"> <li>• Explain the importance of television, radio, film and Internet in the lives of people.</li> <li>• Explain how advertising sells products.</li> <li>• Show or explain what was learned (e.g., audiotape, computer download).</li> </ul>	<p>E. Participate in small and large group discussions and presentations.</p> <ul style="list-style-type: none"> <li>• Participate in everyday conversation.</li> <li>• Present an oral reading.</li> <li>• Deliver research reports.</li> <li>• Conduct interviews.</li> <li>• Plan and participate in group presentations.</li> <li>• Contribute to informal debates.</li> </ul> <p>F. Use media for learning purposes.</p> <ul style="list-style-type: none"> <li>• Compare information received on television with that received on radio or in newspapers.</li> <li>• Access information on Internet.</li> <li>• Discuss the reliability of information received on Internet sources.</li> <li>• Explain how film can represent either accurate versions or fictional versions of the same event.</li> <li>• Explain the role of advertisers in the media.</li> <li>• Use a variety of images and sound to create an effective presentation on a topic.</li> </ul>	<p>E. Participate in small and large group discussions and presentations.</p> <ul style="list-style-type: none"> <li>• Initiate everyday conversation.</li> <li>• Select a topic and present an oral reading.</li> <li>• Conduct interviews as part of the research process.</li> <li>• Organize and participate in informal debates.</li> </ul> <p>F. Use media for learning purposes.</p> <ul style="list-style-type: none"> <li>• Describe how the media provides information that is sometimes accurate, sometimes biased based on a point of view or by the opinion or beliefs of the presenter.</li> <li>• Analyze the role of advertising in the media.</li> <li>• Create a multi-media (e.g., film, music, computer-graphic) presentation for display or transmission.</li> </ul>	<p>E. Participate in small and large group discussions and presentations.</p> <ul style="list-style-type: none"> <li>• Initiate everyday conversation.</li> <li>• Select and present an oral reading on an assigned topic.</li> <li>• Conduct interviews.</li> <li>• Participate in a formal interview (e.g., for job, college).</li> <li>• Organize and participate in informal debate around a specific topic.</li> <li>• Use evaluation guides (e.g., National Issues Forum, Toastmasters) to evaluate group discussion (e.g., of peers, on television).</li> </ul> <p>F. Use media for learning purposes.</p> <ul style="list-style-type: none"> <li>• Use various forms of media to elicit information, to make a student presentation and to complete class assignments and projects.</li> <li>• Evaluate the role of media in focusing attention and forming opinions.</li> <li>• Create a multi-media (e.g., film, music, computer-graphic) presentation for display or transmission that demonstrates an understanding of a specific topic or issue or teaches others about it.</li> </ul>

<b>1.7. Characteristics and Functions of the English Language</b>			
<b>1.7.3. GRADE 3</b>	<b>1.7.5. GRADE 5</b>	<b>1.7.8. GRADE 8</b>	<b>1.7.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Identify words from other languages that are commonly used English words.</p> <p>B. Identify variations in the dialogues of literary characters and relate them to differences in occupation or geographical location.</p>	<p>A. Identify words from other languages that are commonly used English words. Use a dictionary to find the meanings and origins of these words.</p> <p>B. Identify differences in formal and informal speech (e.g., dialect, slang, jargon).</p> <p>C. Identify word meanings that have changed over time (e.g., cool, mouse).</p>	<p>A. Describe the origins and meanings of common, learned and foreign words used frequently in English language (e.g., carte blanche, faux pas).</p> <p>B. Analyze the role and place of standard American English in speech, writing and literature.</p> <p>C. Identify new words that have been added to the English language over time.</p>	<p>A. Describe the influence of historical events on the English language.</p> <p>B. Analyze when differences in language are a source of negative or positive stereotypes among groups.</p> <p>C. Explain and evaluate the role and influence of the English language within and across countries.</p>

1.8. Research			
1.8.3. GRADE 3	1.8.5. GRADE 5	1.8.8. GRADE 8	1.8.11. GRADE 11
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Select a topic for research.</p> <p>B. Locate information using appropriate sources and strategies.</p> <ul style="list-style-type: none"> <li>Locate resources for a particular task (e.g., newspapers, dictionary).</li> <li>Select sources (e.g., dictionaries, encyclopedias, interviews to write a family history, observations, electronic media).</li> <li>Use tables of contents, key words and guide words.</li> <li>Use traditional and electronic search tools.</li> </ul> <p>C. Organize and present the main ideas from research.</p> <ul style="list-style-type: none"> <li>Take notes from sources using a structured format.</li> <li>Summarize, orally or in writing, the main ideas.</li> </ul>	<p>A. Select and refine a topic for research.</p> <p>B. Locate information using appropriate sources and strategies.</p> <ul style="list-style-type: none"> <li>Evaluate the usefulness and qualities of the sources.</li> <li>Select appropriate sources (e.g., dictionaries, encyclopedias, other reference materials, interviews, observations, computer databases).</li> <li>Use tables of contents, indices, key words, cross-references and appendices.</li> <li>Use traditional and electronic search tools.</li> </ul> <p>C. Organize and present the main ideas from research.</p> <ul style="list-style-type: none"> <li>Take notes from sources using a structured format.</li> <li>Present the topic using relevant information.</li> <li>Credit sources using a structured format (e.g., author, title).</li> </ul>	<p>A. Select and refine a topic for research.</p> <p>B. Locate information using appropriate sources and strategies.</p> <ul style="list-style-type: none"> <li>Determine valid resources for researching the topic, including primary and secondary sources.</li> <li>Evaluate the importance and quality of the sources.</li> <li>Select essential sources (e.g., dictionaries, encyclopedias, other reference materials, interviews, observations, computer databases).</li> <li>Use tables of contents, indices, key words, cross-references and appendices.</li> <li>Use traditional and electronic search tools.</li> </ul> <p>C. Organize, summarize and present the main ideas from research.</p> <ul style="list-style-type: none"> <li>Identify the steps necessary to carry out a research project.</li> <li>Take relevant notes from sources.</li> <li>Develop a thesis statement based on research.</li> <li>Give precise, formal credit for others' ideas, images or information using a standard method of documentation.</li> <li>Use formatting techniques to create an understandable presentation for a designated audience.</li> </ul>	<p>A. Select and refine a topic for research.</p> <p>B. Locate information using appropriate sources and strategies.</p> <ul style="list-style-type: none"> <li>Determine valid resources for researching the topic, including primary and secondary sources.</li> <li>Evaluate the importance and quality of the sources.</li> <li>Select sources appropriate to the breadth and depth of the research (e.g., dictionaries, thesauruses, other reference materials, interviews, observations, computer databases).</li> <li>Use tables of contents, indices, key words, cross references and appendices.</li> <li>Use traditional and electronic search tools.</li> </ul> <p>C. Organize, summarize and present the main ideas from research.</p> <ul style="list-style-type: none"> <li>Take notes relevant to the research topic.</li> <li>Develop a thesis statement based on research.</li> <li>Anticipate readers' problems or misunderstandings.</li> <li>Give precise, formal credit for others' ideas, images or information using a standard method of documentation.</li> <li>Use formatting techniques (e.g., headings, graphics) to aid reader understanding.</li> </ul>

III. GLOSSARY

- Alliteration:** The repetition of initial consonant sounds in neighboring words.
- Allusion:** An implied or indirect reference in literature to a familiar person, place or event.
- Analysis:** The process or result of identifying the parts of a whole and their relationships to one another.
- Antonym:** A word that is the opposite of another word.
- Characterization:** The method an author uses to reveal characters and their various personalities.
- Compare:** Place together characters, situations or ideas to show common or differing features in literary selections.

<b>Context clues:</b>	Information from the reading that identifies a word or group of words.
<b>Conventions of Language:</b>	Mechanics, usage and sentence completeness.
<b>Evaluate:</b>	Examine and judge carefully.
<b>Figurative language:</b>	Language that cannot be taken literally since it was written to create a special effect or feeling.
<b>Fluency:</b>	The clear, easy, written or spoken expression of ideas. Freedom from word-identification problems which might hinder comprehension in silent reading or the expression of ideas in oral reading.
<b>Focus:</b>	The center of interest or attention.
<b>Genre:</b>	A category used to classify literary works, usually by form, technique or content (e.g., prose, poetry).
<b>Graphic organizer:</b>	A diagram or pictorial device that shows relationships.
<b>Homophone:</b>	One of two or more words pronounced alike, but different in spelling or meaning (e.g., hair/hare, scale (fish)/scale (musical)).
<b>Hyperbole:</b>	An exaggeration or overstatement (e.g., <i>I was so embarrassed I could have died.</i> )
<b>Idiomatic language:</b>	An expression peculiar to itself grammatically or that cannot be understood if taken literally (e.g., <i>Let's get on the ball.</i> )
<b>Irony:</b>	The use of a word or phrase to mean the exact opposite of its literal or usual meaning; incongruity between the actual result of a sequence of events and the expected result.
<b>Literary conflict:</b>	The struggle that grows out of the interplay of the two opposing forces in a plot.
<b>Literary elements:</b>	The essential techniques used in literature (e.g., characterization, setting, plot, theme).
<b>Literary devices:</b>	Tools used by the author to enliven and provide voice to the writing (e.g., dialogue, alliteration).
<b>Literary structures:</b>	The author's method of organizing text, (e.g., foreshadowing and flashbacks).
<b>Metaphor:</b>	The comparison of two unlike things in which no words of comparison ( <i>like</i> or <i>as</i> ) are used (e.g., <i>That new kid in class is really a squirrel.</i> )
<b>Meter:</b>	The repetition of stressed and unstressed syllables in a line of poetry.
<b>Narrative:</b>	A story, actual or fictional, expressed orally or in writing.
<b>Paraphrase:</b>	Restate text or passage in other words, often to clarify meaning or show understanding.
<b>Pattern book:</b>	A book with a predictable plot structure and often written with predictable text; also known as predictable book.
<b>Personification:</b>	An object or abstract idea given human qualities or human form (e.g., <i>Flowers danced about the lawn.</i> )
<b>Phonics:</b>	The relationship between letters and sounds fundamental in beginning reading.
<b>Point of view:</b>	The way in which an author reveals characters, events and ideas in telling a story; the vantage point from which the story is told.
<b>Public document:</b>	A document that focuses on civic issues or matters of public policy at the community level and beyond.
<b>Reading critically:</b>	Reading in which a questioning attitude, logical analysis and inference are used to judge the worth of text; evaluating relevancy and adequacy of what is read; the judgment of validity or worth of what is read, based on sound criteria.
<b>Reading rate:</b>	The speed at which a person reads, usually silently.
<b>Research:</b>	A systematic inquiry into a subject or problem in order to discover, verify or revise relevant facts or principles having to do with that subject or problem.
<b>Satire:</b>	A literary tone used to ridicule or make fun of human vice or weakness.
<b>Self-monitor:</b>	Know when what one is reading or writing is not making sense; adjust strategies for comprehension.
<b>Semantics:</b>	The study of meaning in language.
<b>Simile:</b>	A comparison of two unlike things in which a word of comparison ( <i>like</i> or <i>as</i> ) is used (e.g., <i>She eats like a bird.</i> )
<b>Sources:</b>	
<b>Primary:</b>	Text and/or artifacts that tell or show a first-hand account of an event; original works used when researching.
<b>Secondary:</b>	Text and/or artifacts used when researching that are derived from something original.
<b>Subject area:</b>	An organized body of knowledge; a discipline; a content area.

<b>Style:</b>	How an author writes; an author's use of language, its effects and appropriateness to the author's intent and theme.
<b>Synonym:</b>	One of two or more words in a language that have highly similar meanings (e.g., sorrow, grief, sadness).
<b>Syntax:</b>	The pattern or structure of word order in sentences, clauses and phrases.
<b>Theme:</b>	A topic of discussion or writing; a major idea broad enough to cover the entire scope of a literary work.
<b>Thesis:</b>	The basic argument advanced by a speaker or writer who then attempts to prove it; the subject or major argument of a speech or composition.
<b>Tone:</b>	The attitude of the author toward the audience and characters (e.g., serious or humorous).
<b>Voice:</b>	The fluency, rhythm and liveliness in writing that makes it unique to the writer.

**Academic Standards for Mathematics**

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**V. INTRODUCTION**

This document includes Mathematics Standards:

- 2.1. Numbers, Number Systems and Number Relationships
- 2.2. Computation and Estimation
- 2.3. Measurement and Estimation
- 2.4. Mathematical Reasoning and Connections
- 2.5. Mathematical Problem Solving and Communication
- 2.6. Statistics and Data Analysis
- 2.7. Probability and Predictions
- 2.8. Algebra and Functions
- 2.9. Geometry
- 2.10. Trigonometry
- 2.11. Concepts of Calculus

The Mathematics Standards describe what students should know and be able to do at four grade levels (third, fifth, eighth and eleventh). They reflect the increasing complexity and sophistication that students are expected to achieve as they progress through school.

This document avoids repetition of learned skills, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

Students who achieve these mathematical standards will be able to communicate mathematically. Although it is an interesting and enjoyable study for its own sake, mathematics is most appropriately used as a tool to help organize and understand information from other academic disciplines. Because our capacity to deal with all things mathematical is changing rapidly, students must be able to bring the most modern and effective technology to bear on their learning of mathematical concepts and skills.

A glossary is included to assist the reader in understanding terminology contained in the standards.

<b>2.1. Numbers, Number Systems and Number Relationships</b>			
<b>2.1.3. GRADE 3</b>	<b>2.1.5. GRADE 5</b>	<b>2.1.8. GRADE 8</b>	<b>2.1.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Count using whole numbers (to 10,000) and by 2's, 3's, 5's, 10's, 25's and 100's.</p> <p>B. Use whole numbers and fractions to represent quantities.</p> <p>C. Represent equivalent forms of the same number through the use of concrete objects, drawings, word names and symbols.</p> <p>D. Use drawings, diagrams or models to show the concept of fraction as part of a whole.</p> <p>E. Count, compare and make change using a collection of coins and one-dollar bills.</p> <p>F. Apply number patterns (even and odd) and compare values of numbers on the hundred board.</p> <p>G. Use concrete objects to count, order and group.</p> <p>H. Demonstrate understanding of one-to-one correspondence.</p> <p>I. Apply place-value concepts and numeration to counting, ordering and grouping.</p> <p>J. Estimate, approximate, round or use exact numbers as appropriate.</p> <p>K. Describe the inverse relationship between addition and subtraction.</p> <p>L. Demonstrate knowledge of basic facts in four basic operations.</p>	<p>A. Use expanded notation to represent whole numbers or decimals.</p> <p>B. Apply number theory concepts to rename a number quantity (e.g., six, <math>6</math>, <math>12/2</math>, <math>3 \times 2</math>, <math>10 - 4</math>).</p> <p>C. Demonstrate that mathematical operations can represent a variety of problem situations.</p> <p>D. Use models to represent fractions and decimals.</p> <p>E. Explain the concepts of prime and composite numbers.</p> <p>F. Use simple concepts of negative numbers (e.g., on a number line, in counting and in temperature).</p> <p>G. Develop and apply number theory concepts (e.g., primes, factors, multiples, composites) to represent numbers in various ways.</p>	<p>A. Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).</p> <p>B. Simplify numerical expressions involving exponents, scientific notation and using order of operations.</p> <p>C. Distinguish between and order rational and irrational numbers.</p> <p>D. Apply ratio and proportion to mathematical problem situations involving distance, rate, time and similar triangles.</p> <p>E. Simplify and expand algebraic expressions using exponential forms.</p> <p>F. Use the number line model to demonstrate integers and their applications.</p> <p>G. Use the inverse relationships between addition, subtraction, multiplication, division, exponentiation and root extraction to determine unknown quantities in equations.</p>	<p>A. Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).</p>

<b>2.2. Computation and Estimation</b>			
<b>2.2.3. GRADE 3</b>	<b>2.2.5. GRADE 5</b>	<b>2.2.8. GRADE 8</b>	<b>2.2.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i></b>			
<p>A. Apply addition and subtraction in everyday situations using concrete objects.</p> <p>B. Solve single- and double-digit addition and subtraction problems with regrouping in vertical form.</p> <p>C. Demonstrate the concept of multiplication as repeated addition and arrays.</p> <p>D. Demonstrate the concept of division as repeated subtraction and as sharing.</p> <p>E. Use estimation skills to arrive at conclusions.</p> <p>F. Determine the reasonableness of calculated answers.</p> <p>G. Explain addition and subtraction algorithms with regrouping.</p>	<p>A. Create and solve word problems involving addition, subtraction, multiplication and division of whole numbers.</p> <p>B. Develop and apply algorithms to solve word problems that involve addition, subtraction, and/or multiplication with decimals with and without regrouping.</p> <p>C. Develop and apply algorithms to solve word problems that involve addition, subtraction, and/or multiplication with fractions and mixed numbers that include like and unlike denominators.</p> <p>D. Demonstrate the ability to round numbers.</p> <p>E. Determine through estimations the reasonableness of answers to problems involving addition, subtraction, multiplication and division of whole numbers.</p> <p>F. Demonstrate skills for using fraction calculators to verify conjectures, confirm computations and explore complex problem-solving situations.</p> <p>G. Apply estimation strategies to a variety of problems including time and money.</p> <p>H. Explain multiplication and division algorithms.</p> <p>I. Select a method for computation and explain why it is appropriate.</p>	<p>A. Complete calculations by applying the order of operations.</p> <p>B. Add, subtract, multiply and divide different kinds and forms of rational numbers including integers, decimal fractions, percents and proper and improper fractions.</p> <p>C. Estimate the value of irrational numbers.</p> <p>D. Estimate amount of tips and discounts using ratios, proportions and percents.</p> <p>E. Determine the appropriateness of overestimating or underestimating in computation.</p> <p>F. Identify the difference between exact value and approximation and determine which is appropriate for a given situation.</p>	<p>A. Develop and use computation concepts, operations and procedures on real numbers in problem solving situations.</p> <p>B. Use estimation to solve problems for which exact answer is not needed.</p> <p>C. Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.</p> <p>D. Describe and explain the amount of error that may exist in a computation using estimates.</p> <p>E. Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure.</p> <p>F. Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.</p>

<b>2.3. Measurement and Estimation</b>			
<b>2.3.3. GRADE 3</b>	<b>2.3.5. GRADE 5</b>	<b>2.3.8. GRADE 8</b>	<b>2.3.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Compare measurable characteristics of different objects on the same dimensions (e.g., time, temperature, area, length, weight, capacity, perimeter).</p> <p>B. Determine the measurement of objects with nonstandard and standard units (e.g., US customary and metric).</p> <p>C. Determine and compare elapsed times.</p> <p>D. Tell time (analog and digital) to the minute.</p> <p>E. Determine appropriate unit of measure.</p> <p>F. Use concrete objects to determine area and perimeter.</p> <p>G. Estimate and verify measurements.</p> <p>Demonstrate that a single object has different attributes that can be measured in different ways (e.g. length, mass, weight, time, area, temperature, capacity, perimeter).</p>	<p>A. Select and use appropriate instruments and units for measuring quantities (e.g., perimeter, volume, area, weight, time, temperature).</p> <p>B. Select and use standard tools to measure the size of figures with specified accuracy, including length, width, perimeter and area.</p> <p>C. Estimate, refine and verify specified measurements of objects.</p> <p>D. Convert linear measurements within the same system.</p> <p>E. Add and subtract measurements.</p>	<p>A. Develop formulas and procedures for determining measurements (e.g., area, volume, distance).</p> <p>B. Solve rate problems (e.g., rate x time = distance, principal x interest rate = interest).</p> <p>C. Measure angles in degrees and determine relations of angles.</p> <p>D. Estimate, use and describe measures of distance, rate, perimeter, area, volume, weight, mass and angles.</p> <p>E. Describe how a change in linear dimension of an object affects its perimeter, area and volume.</p> <p>F. Use scale measurements to interpret maps or drawings.</p> <p>G. Create and use scale models.</p>	<p>A. Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.</p> <p>B. Measure and compare angles in degrees and radians.</p> <p>C. Demonstrate the ability to produce measures with specified levels of precision.</p>

<b>2.4. Mathematical Reasoning and Connections</b>			
<b>2.4.3. GRADE 3</b>	<b>2.4.5. GRADE 5</b>	<b>2.4.8. GRADE 8</b>	<b>2.4.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Make, check and verify predictions about the quantity, size and shape of objects and groups of objects.</p> <p>B. Use measurements in everyday situations (e.g., determine the geography of the school building).</p>	<p>A. Compare quantities and magnitudes of numbers.</p> <p>B. Use models, number facts, properties and relationships to check and verify predictions and explain reasoning.</p> <p>C. Draw inductive and deductive conclusions within mathematical contexts.</p>	<p>A. Make conjectures based on logical reasoning and test conjectures by using counter-examples.</p> <p>B. Combine numeric relationships to arrive at a conclusion.</p> <p>C. Use if . . . then statements to construct simple valid arguments.</p>	<p>A. Use direct proofs, indirect proofs or proof by contradiction to validate conjectures.</p> <p>B. Construct valid arguments from stated facts.</p> <p>C. Determine the validity of an argument.</p>



<b>2.4. Mathematical Reasoning and Connections</b>			
<b>2.4.3. GRADE 3</b>	<b>2.4.5. GRADE 5</b>	<b>2.4.8. GRADE 8</b>	<b>2.4.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
	<p>D. Distinguish between relevant and irrelevant information in a mathematical problem.</p> <p>E. Interpret statements made with precise language of logic (e.g., "all", "or", "every", "none", "some", "or", "many").</p> <p>F. Use statistics to quantify issues (e.g., in social studies, in science).</p>	<p>D. Construct, use and explain algorithmic procedures for computing and estimating with whole numbers, fractions, decimals and integers.</p> <p>E. Distinguish between inductive and deductive reasoning.</p> <p>F. Use measurements and statistics to quantify issues (e.g., in family and consumer science situations).</p>	<p>D. Use truth tables to reveal the logic of mathematical statements.</p> <p>E. Demonstrate mathematical solutions to problems (e.g., in the physical sciences).</p>

<b>2.5. Mathematical Problem Solving and Communication</b>			
<b>2.5.3. GRADE 3</b>	<b>2.5.5. GRADE 5</b>	<b>2.5.8. GRADE 8</b>	<b>2.5.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Use appropriate problem-solving strategies (e.g., guess and check, working backwards).</p> <p>B. Determine when sufficient information is present to solve a problem and explain how to solve a problem.</p> <p>C. Select and use an appropriate method, materials and strategy to solve problems, including mental mathematics, paper and pencil and concrete objects.</p>	<p>A. Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved.</p> <p>B. Use appropriate mathematical terms, vocabulary, language symbols and graphs to clearly and logically explain solutions to problems.</p> <p>C. Show ideas in a variety of ways, including words, numbers, symbols, pictures, charts, graphs, tables, diagrams and models.</p> <p>D. Connect, extend and generalize problem solutions to other concepts, problems and circumstances in mathematics.</p>	<p>A. Invent, select, use and justify the appropriate methods, materials and strategies used to solve problems.</p> <p>B. Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.</p> <p>C. Justify strategies and defend approaches used and conclusions reached.</p> <p>D. Determine pertinent information in problem situations and whether any further information is needed for solution.</p>	<p>A. Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.</p> <p>B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p> <p>C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.</p> <p>D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.</p>

<b>2.5. Mathematical Problem Solving and Communication</b>			
<b>2.5.3. GRADE 3</b>	<b>2.5.5. GRADE 5</b>	<b>2.5.8. GRADE 8</b>	<b>2.5.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
	<p>E. Select, use and justify the methods, materials and strategies used to solve problems.</p> <p>F. Use appropriate problem-solving strategies (e.g., solving a simpler problem, drawing a picture or diagram).</p>		

<b>2.6. Statistics and Data Analysis</b>			
<b>2.6.3. GRADE 3</b>	<b>2.6.5. GRADE 5</b>	<b>2.6.8. GRADE 8</b>	<b>2.6.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Gather, organize and display data using pictures, tallies, charts, bar graphs and pictographs.</p> <p>B. Formulate and answer questions based on data shown on graphs.</p> <p>C. Predict the likely number of times a condition will occur based on the analyzed data.</p> <p>D. Form and justify an opinion on whether a given statement is reasonable based on a comparison to data.</p>	<p>A. Organize and display data using pictures, tallies, tables, charts, bar graphs and circle graphs.</p> <p>B. Describe data sets using mean, median, mode and range.</p> <p>C. Sort data using Venn diagrams.</p> <p>D. Predict the likely number of times a condition will occur based on analyzed data.</p> <p>E. Construct and defend simple conclusions based on data.</p>	<p>A. Compare and contrast different plots of data using values of mean, median, mode, quartiles and range.</p> <p>B. Explain effects of sampling procedures and missing or incorrect information on reliability.</p> <p>C. Fit a line to the scatter plot of two quantities and describe any correlation of the variables.</p> <p>D. Design and carry out a random sampling procedure.</p> <p>E. Analyze and display data in stem-and-leaf and box-and-whisker plots.</p> <p>F. Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.</p> <p>G. Determine the validity of the sampling method described in studies published in local or National newspapers.</p>	<p>A. Design and conduct an experiment using random sampling. Describe the data as an example of a distribution using statistical measures of center and spread. Organize and represent the results with graphs. (Use standard deviation, variance and t-tests).</p> <p>B. Use appropriate technology to organize and analyze data taken from the local community.</p> <p>C. Determine the regression equation of best fit (e.g., linear, quadratic and exponential).</p> <p>D. Make predictions using interpolation, extrapolation, regression and estimation using technology to verify them.</p> <p>E. Determine the validity of the sampling method described in a given study.</p> <p>F. Determine the degree of dependence of two quantities specified by a two-way table.</p> <p>G. Describe questions of experimental design, control groups, treatment groups, cluster sampling and reliability.</p> <p>H. Use sampling techniques to draw inferences about large populations.</p>

<b>2.6. Statistics and Data Analysis</b>			
<b>2.6.3. GRADE 3</b>	<b>2.6.5. GRADE 5</b>	<b>2.6.8. GRADE 8</b>	<b>2.6.11. GRADE 11</b>
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i>			
			I. Describe the normal curve and use its properties to answer questions about sets of data that are assumed to be normally distributed.

<b>2.7. Probability and Predictions</b>			
<b>2.7.3. GRADE 3</b>	<b>2.7.5. GRADE 5</b>	<b>2.7.8. GRADE 8</b>	<b>2.7.11. GRADE 11</b>
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills needed to:</i>			
A. Predict and measure the likelihood of events and recognize that the results of an experiment may not match predicted outcomes.  B. Design a fair and an unfair spinner.  C. List or graph the possible results of an experiment.  D. Analyze data using the concepts of largest, smallest, most often, least often and middle.	A. Perform simulations with concrete devices (e.g., dice, spinner) to predict the chance of an event occurring.  B. Determine the fairness of the design of a spinner.  C. Express probabilities as fractions and decimals.  D. Compare predictions based on theoretical probability and experimental results.  E. Calculate the probability of a simple event.  F. Determine patterns generated as a result of an experiment.  G. Determine the probability of an event involving "and", "or" or "not".  H. Predict and determine why some outcomes are certain, more likely, less likely, equally likely or impossible.  I. Find all possible combinations and arrangements involving a limited number of variables.  J. Develop a tree diagram and list the elements.	A. Determine the number of combinations and permutations for an event.  B. Present the results of an experiment using visual representations (e.g., tables, charts, graphs).  C. Analyze predictions (e.g., election polls).  D. Compare and contrast results from observations and mathematical models.  E. Make valid inferences, predictions and arguments based on probability.	A. Compare odds and probability.  B. Apply probability and statistics to perform an experiment involving a sample and generalize its results to the entire population.  C. Draw and justify a conclusion regarding the validity of a probability or statistical argument.  D. Use experimental and theoretical probability distributions to make judgments about the likelihood of various outcomes in uncertain situations.  E. Solve problems involving independent simple and compound events.

<b>2.8. Algebra and Functions</b>			
<b>2.8.3. GRADE 3</b>	<b>2.8.5. GRADE 5</b>	<b>2.8.8. GRADE 8</b>	<b>2.8.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
A. Recognize, describe, extend, create and replicate a variety of patterns including attribute, activity, number and geometric patterns.	A. Recognize, reproduce, extend, create and describe patterns, sequences and relationships verbally, numerically, symbolically and graphically, using a variety of materials.	A. Apply simple algebraic patterns to basic number theory and to spatial relations.	A. Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
B. Use concrete objects and trial and error to solve number sentences and check if solutions are sensible and accurate.	B. Connect patterns to geometric relations and basic number skills.	B. Discover, describe and generalize patterns, including linear, exponential and simple quadratic relationships.	B. Give examples of patterns that occur in data from other disciplines.
C. Substitute a missing addend in a number sentence.	C. Form rules based on patterns (e.g., an equation that relates pairs in a sequence).	C. Create and interpret expressions, equations or inequalities that model problem situations.	C. Use patterns, sequences and series to solve routine and nonroutine problems.
D. Create a story to match a given combination of symbols and numbers.	D. Use concrete objects and combinations of symbols and numbers to create expressions that model mathematical situations.	D. Use concrete objects to model algebraic concepts.	D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and nonroutine problem situations.
E. Use concrete objects and symbols to model the concepts of variables, expressions, equations and inequalities.	E. Explain the use of combinations of symbols and numbers in expressions, equations and inequalities.	E. Select and use a strategy to solve an equation or inequality, explain the solution and check the solution for accuracy.	E. Use equations to represent curves (e.g., lines, circles, ellipses, parabolas, hyperbolas).
F. Explain the meaning of solutions and symbols.	F. Describe a realistic situation using information given in equations, inequalities, tables or graphs.	F. Solve and graph equations and inequalities using scientific and graphing calculators and computer spreadsheets.	F. Identify whether systems of equations and inequalities are consistent or inconsistent.
G. Use a table or a chart to display information.	G. Select and use appropriate strategies, including concrete materials, to solve number sentences and explain the method of solution.	G. Represent relationships with tables or graphs in the coordinate plane and verbal or symbolic rules.	G. Analyze and explain systems of equations, systems of inequalities and matrices.
H. Describe and interpret the data shown in tables and charts.	H. Locate and identify points on a coordinate system.	H. Graph a linear function from a rule or table.	H. Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets and other software.
I. Demonstrate simple function rules.	I. Generate functions from tables of data and relate data to corresponding graphs and functions.	I. Generate a table or graph from a function and use graphing calculators and computer spreadsheets to graph and analyze functions.	I. Use matrices to organize and manipulate data, including matrix addition, subtraction, multiplication and scalar multiplication.

<b>2.8. Algebra and Functions</b>			
<b>2.8.3. GRADE 3</b>	<b>2.8.5. GRADE 5</b>	<b>2.8.8. GRADE 8</b>	<b>2.8.11. GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>J. Analyze simple functions and relationships and locate points on a simple grid.</p>		<p>J. Show that an equality relationship between two quantities remains the same as long as the same change is made to both quantities; explain how a change in one quantity determines another quantity in a functional relationship.</p>	<p>J. Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.</p> <p>K. Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y-intercepts, graphing by transformations and the use of a graphing calculator.</p> <p>L. Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.</p> <p>M. Given a set of data points, write an equation for a line of best fit.</p> <p>N. Solve linear, quadratic and exponential equations both symbolically and graphically.</p> <p>O. Determine the domain and range of a relation, given a graph or set of ordered pairs.</p> <p>P. Analyze a relation to determine whether a direct or inverse variation exists and represent it algebraically and graphically.</p> <p>Q. Represent functional relationships in tables, charts and graphs.</p> <p>R. Create and interpret functional models.</p> <p>S. Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).</p> <p>T. Analyze and categorize functions by their characteristics.</p>

<b>2.9. Geometry</b>			
<b>2.9.3 GRADE 3</b>	<b>2.9.5. GRADE 5</b>	<b>2.9.8 GRADE 8</b>	<b>2.9.11 GRADE 11</b>
<b><i>Pennsylvania's public school shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Name and label geometric shapes in two and three dimensions (e.g., circle/sphere, square/cube, triangle/pyramid, rectangle/prism).</p> <p>B. Build geometric shapes using concrete objects (e.g., manipulatives).</p> <p>C. Draw two- and three-dimensional geometric shapes and construct rectangles, squares and triangles on the geoboard and on graph paper satisfying specific criteria.</p> <p>D. Find and describe geometric figures in real life.</p> <p>E. Identify and draw lines of symmetry in geometric figures.</p> <p>F. Identify symmetry in nature.</p> <p>G. Fold paper to demonstrate the reflections about a line.</p> <p>H. Show relationships between and among figures using reflections.</p> <p>I. Predict how shapes can be changed by combining or dividing them.</p>	<p>A. Give formal definitions of geometric figures.</p> <p>B. Classify and compare triangles and quadrilaterals according to sides or angles.</p> <p>C. Identify and measure circles, their diameters and radii.</p> <p>D. Describe in words how geometric shapes are constructed.</p> <p>E. Construct two- and three-dimensional shapes and figures using manipulatives, geoboards and computer software.</p> <p>F. Find familiar solids in the environment and describe them.</p> <p>G. Create an original tessellation.</p> <p>H. Describe the relationship between the perimeter and area of triangles, quadrilaterals and circles.</p> <p>I. Represent and use the concepts of line, point and plane.</p> <p>J. Define the basic properties of squares, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, triangles, cubes, prisms, spheres and cylinders.</p>	<p>A. Construct figures incorporating perpendicular and parallel lines, the perpendicular bisector of a line segment and an angle bisector using computer software.</p> <p>B. Draw, label, measure and list the properties of complementary, supplementary and vertical angles.</p> <p>C. Classify familiar polygons as regular or irregular up to a decagon.</p> <p>D. Identify, name, draw and list all properties of squares, cubes, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, spheres, triangles, prisms and cylinders.</p> <p>E. Construct parallel lines, draw a transversal and measure and compare angles formed (e.g., alternate interior and exterior angles).</p> <p>F. Distinguish between similar and congruent polygons.</p> <p>G. Approximate the value of <math>\pi</math> (pi) through experimentation.</p> <p>H. Use simple geometric figures (e.g., triangles and squares) to create, through rotation, transformational figures in three dimensions.</p> <p>I. Generate transformations using computer software.</p> <p>J. Analyze geometric patterns (e.g., tessellations and sequences of shapes) and develop descriptions of the patterns.</p>	<p>A. Construct geometric figures using dynamic geometry tools (e.g., Geometer's Sketchpad, Cabri Geometre).</p> <p>B. Prove two triangles or two polygons are congruent or similar using algebraic, coordinate and deductive proofs.</p> <p>C. Identify and prove the properties of quadrilaterals involving opposite sides and angles, consecutive sides and angles and diagonals using deductive proofs.</p> <p>D. Identify corresponding parts in congruent triangles to solve problems.</p> <p>E. Solve problems involving inscribed and circumscribed polygons.</p> <p>F. Use the properties of angles, arcs, chords, tangents and secants to solve problems involving circles.</p> <p>G. Solve problems using analytic geometry.</p> <p>H. Construct a geometric figure and its image using various transformations.</p> <p>I. Model situations geometrically to formulate and solve problems.</p> <p>J. Analyze figures in terms of the kinds of symmetries they have.</p>

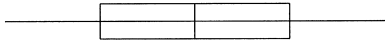
<b>2.9. Geometry</b>			
<b>2.9.3 GRADE 3</b>	<b>2.9.5. GRADE 5</b>	<b>2.9.8 GRADE 8</b>	<b>2.9.11 GRADE 11</b>
<b><i>Pennsylvania's public school shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
	<p>K. Analyze simple transformations of geometric figures and rotations of line segments.</p> <p>L. Identify properties of geometric figures (e.g., parallel, perpendicular, similar, congruent, symmetrical).</p>	<p>K. Analyze objects to determine if they illustrate tessellations, symmetry, congruence, similarity and scale.</p>	

<b>2.10. Trigonometry</b>			
<b>2.10.3 GRADE 3</b>	<b>2.10.5. GRADE 5</b>	<b>2.10.8 GRADE 8</b>	<b>2.10.11 GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Identify right angles in the environment.</p> <p>B. Model right angles and right triangles using concrete objects.</p>	<p>A. Identify and compare parts of right triangles including right angles, acute angles, hypotenuses and legs.</p> <p>B. Create right triangles on a geoboard.</p>	<p>A. Compute measures of sides and angles using proportions, the Pythagorean Theorem and right triangle relationships.</p> <p>B. Solve problems requiring indirect measurement for lengths of sides of triangles.</p>	<p>A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs.</p> <p>B. Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.</p>

<b>2.11. Concepts of Calculus</b>			
<b>2.11.3 GRADE 3</b>	<b>2.11.5. GRADE 5</b>	<b>2.11.8 GRADE 8</b>	<b>2.11.11 GRADE 11</b>
<b><i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i></b>			
<p>A. Identify whole number quantities and measurements from least to most and greatest value.</p> <p>B. Identify least and greatest values represented in bar graphs and pictographs.</p> <p>C. Categorize rates of change as faster and slower.</p> <p>D. Continue a pattern of numbers or objects that could be extended infinitely.</p>	<p>A. Make comparisons of numbers (e.g., more, less, same, least, most, greater than, less than).</p> <p>B. Identify least and greatest values represented in bar and circle graphs.</p> <p>C. Identify maximum and minimum.</p> <p>D. Describe the relationship between rates of change and time.</p> <p>E. Estimate areas and volumes as the sums of areas of tiles and volumes of cubes.</p>	<p>A. Analyze graphs of related quantities for minimum and maximum values and justify the findings.</p> <p>B. Describe the concept of unit rate, ratio, and slope in context of rate of change.</p> <p>C. Continue a pattern of numbers or objects that could be extended infinitely.</p>	<p>A. Determine maximum and minimum values of a function over a specified interval.</p> <p>B. Interpret maximum and minimum values in problem situations.</p> <p>C. Graph and interpret rates of growth/decay.</p> <p>D. Determine sums of finite sequences of numbers and infinite geometric series.</p> <p>E. Estimate areas under curves using sequences of areas.</p>

2.11. Concepts of Calculus			
2.11.3 GRADE 3	2.11.5. GRADE 5	2.11.8 GRADE 8	2.11.11 GRADE 11
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize the student's maximum potential and to acquire the knowledge and skills to:</i>			
	F. Describe the relationship between the size of the unit of measurement and the estimate of the areas and volumes.		

## VI. GLOSSARY

- Absolute value:** A number's distance from zero on a number line. The absolute value of 2 is equal to the absolute value of  $-2$ .
- Algorithm:** A method of performing an arithmetic operation.
- Analog time:** Time displayed on a timepiece having hour and minute hands.
- Array:** Arrangement of a series of items according to the values of the items, e.g., largest to smallest.
- Box-and-whisker plot:** A graphic method for showing a summary of data using median, quartiles and extremes of data.
- 
- Combination:** A subset of the elements in a given set, without regard to the order in which those elements are arranged.
- Composite number:** Any positive integer exactly divisible by one or more positive integers other than itself and 1.
- Congruent:** Having the same shape and the same size.
- Conjecture:** A statement believed to be true but not proved.
- Coordinate system:** A method of locating points in the plane or in space by means of numbers. A point in the plane is located by its distances from both a horizontal and a vertical line called the axes. The horizontal line is called the x-axis. The vertical line is called the y-axis. The pairs of numbers are called ordered pairs. The first number, called the x-coordinate, designates the distance along the horizontal axis. The second number, called the y-coordinate, designates the distance along the vertical axis. The point at which the two axes intersect has the coordinates (0,0) and is called the origin.
- Correlation:** A measure of the mutual relationship between two variables.
- Customary system:** A system of weights and measures frequently used in the United States. The basic unit of weight is the pound; the basic unit of capacity is the quart.
- Deductive reasoning:** The process of reasoning from statements accepted as true to reach a conclusion.
- Direct variation:** Two variables are so related that their ratio remains constant.
- Domain:** The set of all possible values for the unknown in an open sentence.
- Equation:** A statement of equality between two mathematical expressions (e.g.,  $X + 5 = Y - 2$ ).
- Equivalent forms:** Different forms of numbers that name the same number (e.g., fraction, decimal, percent as  $1/2$ ,  $.5$ ,  $50\%$ ).
- Expanded notation:** Involves writing the number in expanded form to show the value of each digit (e.g.,  $15,629 = 10,000 + 5,000 + 600 + 20 + 9$ ).
- Exponential function:** A function whose general equation is  $y = a \times b^x$  or  $y = a \times b^{kx}$ , where a, b and k stand for constants.
- Exponent:** A numeral used to tell how many times a number or variable is used as a factor (e.g.,  $a^2$ ,  $2^n$ ,  $y^x$ ).
- Expression:** A mathematical phrase that can include operations, numerals and variables. In algebraic terms:  $2l + 3x$ ; in numeric terms:  $13.4 - 4.7$ .
- Factor:** The number or variable multiplied in a multiplication expression.
- Factorial:** The expression  $n!$  (n factorial) is the product of all the numbers from 1 to n for any positive integer n.
- Function:** A relation in which each value of an independent variable is associated with a unique value of the dependent value.



<b>Geoboard:</b>	A board with pegs aligned in grid fashion that permits rubber bands to be wrapped around pegs to form geometric figures.
<b>Graphing calculator:</b>	A calculator that will store and draw the graphs of several functions at once.
<b>Independent events:</b>	Events such that the outcome of the first event has no effect on the probabilities of the outcome of the second event (e.g., two tosses of the same coin are independent events).
<b>Inductive reasoning:</b>	Generalizations made from particular observations in a common occurrence.
<b>Inequality:</b>	A mathematical sentence that contains a symbol, (e.g., $>$ , $<$ , $\geq$ , $\leq$ or $\neq$ ) in which the terms on either side of the symbol are unequal (e.g., $x < y$ , $7 > 3$ , $n \geq 4$ ).
<b>Infinite:</b>	Has no end or goes on forever.
<b>Integer:</b>	A number that is a positive whole number, a negative whole number or zero.
<b>Inverse:</b>	A new conditional formed by negating both the antecedent and the consequent of a conditional.
<b>Inverse operations:</b>	Operations that undo each other (e.g., addition and subtraction are inverse operations; multiplication and division are inverse operations).
<b>Inverse variation:</b>	When the ratio of one variable to the reciprocal of the other is constant, one of them is said to vary inversely as the other.
<b>Irrational number:</b>	A number that cannot be written as a simple fraction. It is an infinite and nonrepeating decimal.
<b>Limit:</b>	A number to which the terms of a sequence get closer so that beyond a certain term all terms are as close as desired to that number.
<b>Line of best fit:</b>	The line that fits a set of data points with the smallest value for the sum of the squares of the errors (vertical distances) from the data points to the line; the regression line.
<b>Linear function:</b>	A function whose general equation is $y = mx + b$ , where $m$ and $b$ stand for constants and $m \neq 0$ .
<b>Linear measurement:</b>	Measurement in a straight line.
<b>Logarithm:</b>	The exponent indicating the power to which a fixed number, the base, must be raised to produce a given number. For example, if $n^x = a$ , the logarithm of $a$ , with $n$ as the base, is $x$ ; symbolically, $\log_n a = x$ . If the base is 10, the log of 100 is 2.
<b>Manipulatives:</b>	Materials that allow students to explore mathematical concepts in a concrete mode.
<b>Mathematical model:</b>	A representation in the mathematical world of some phenomenon in the real world. It frequently consists of a function or relation specifying how two variables are related.
<b>Matrix:</b>	A rectangular array of numbers representing such things as the coefficients in a system of equations arranged in rows and columns.
<b>Maximum:</b>	The greatest number in a set of data.
<b>Mean:</b>	The sum of the set of numbers divided by $n$ , the number of numbers in the set.
<b>Median:</b>	The number that lies in the middle when a set of numbers is arranged in order. If there are two middle values, the median is the mean of these values.
<b>Metric system:</b>	A system of measurement used throughout the world based on factors of 10. It includes measures of length, weight and capacity.
<b>Minimum:</b>	The least number in a set of data.
<b>Missing addend:</b>	A member of an addition number sentence in which that term is missing (e.g., $5 + \underline{\quad} = 8$ ).
<b>Mode:</b>	The number(s) that occurs most often in a set of numbers (e.g., in the set 1, 2, 3, 3, 5, 8; the mode is 3).
<b>Multiple:</b>	A number that is the product of a given integer and another integer (e.g., 6 and 9 are multiples of 3).
<b>Normal curve:</b>	A graphical plot of a mathematical function (frequency distribution) which is unimodal and symmetrical.
<b>One-to-one correspondence:</b>	When one and only one element of a second set is assigned to an element of a first set, all elements of the second set are assigned, and every element of the first set has an assignment, the mapping is called one-to-one (e.g., in the set Bill Clinton, George Bush, Ronald Reagan, Jimmy Carter, Hillary Clinton, Barbara Bush, Nancy Reagan and Rosalynn Carter, there is a one-to-one correspondence between the pairs.)
<b>Open sentence:</b>	A statement that contains at least one unknown. It becomes true or false when a quantity is substituted for the unknown (e.g., $x + 5 = 9$ , $y - 2 = 7$ ).

<b>Order of operations:</b>	Rules for evaluating an expression: work first within parentheses; then calculate all powers, from left to right; then do multiplications or divisions, from left to right; then do additions and subtractions, from left to right.
<b>Patterns:</b>	Regularities in situations such as those in nature, events, shapes, designs and sets of numbers (e.g., spirals on pineapples, geometric designs in quilts, the number sequence 3, 6, 9, 12, . . .).
<b>Permutation:</b>	An arrangement of a given number of objects from a given set in which the order of the objects is significant.
<b>Perpendicular lines:</b>	Two lines that intersect to form right angles. (e.g., $\perp$ , $\lrcorner$ , $\llcorner$ ).
<b>Plotting points:</b>	Locating points by means of coordinates, or a curve by plotted points, representing an equation by means of a curve so constructed.
<b>Polygon:</b>	A union of segments connected end to end, so that each segment intersects exactly two others at its endpoints.



<b>Powers:</b>	A number expressed using an exponent. The number $5^3$ is read five to the third power or five cubed.
<b>Prime:</b>	An integer greater than one whose only positive factors are 1 and itself (e.g., 2, 3, 5, 7, 11, 13, 17 and 19).
<b>Probability:</b>	A number from 0 to 1 that indicates how likely something is to happen.
<b>Problem solving:</b>	Finding ways to reach a goal when no routine path is apparent.
<b>Proof by contradiction:</b>	A proof in which, if $s$ is to be proven, one reasons from not- $s$ until a contradiction is deduced; from this it is concluded that not- $s$ is false, which means that $s$ is true.
<b>Proportion:</b>	An equation of the form $a/b = c/d$ that states that the two ratios are equivalent.
<b>Quadrilateral:</b>	A four-sided polygon.
<b>Quartiles:</b>	The three values that divide an ordered set into four subsets of approximately equal size. The second quartile is the median.
<b>Radian:</b>	A unit of angular measure equal to $\frac{1}{2}\pi$ of a complete revolution.
<b>Range (1):</b>	The difference between the greatest number and the least number in a set of data.
<b>Range (2):</b>	The set of output values for a function.
<b>Rate of change:</b>	The limit of the ratio of an increment of the function value at the point to that of the independent variable as the increment of the variable approaches zero.
<b>Ratio:</b>	A comparison of two numbers by division.
<b>Rational numbers:</b>	Any number that can be written in the form $a/b$ where $a$ is any integer and $b$ is any integer except zero.
<b>Real numbers:</b>	The set consisting of all rational numbers and all irrational numbers.
<b>Reasonableness:</b>	Quality of a solution so that it is not extreme or excessive.
<b>Reciprocal:</b>	The fractional number that results from dividing one by the number.
<b>Rectangular prism:</b>	A three-dimensional figure whose sides are all rectangles; a box.
<b>Reflection:</b>	A transformation that produces the mirror image of a geometric figure.
<b>Regression:</b>	The line that represents the least deviation from the points in a scatter plot of data.
<b>Regular polygon:</b>	A polygon in which all sides have the same measure and all angles have the same measure.
<b>Relation:</b>	A set of ordered pairs.
<b>Reliability:</b>	The extent to which a measuring procedure yields the same results on repeated trials.
<b>Repeated addition:</b>	A model for multiplication (e.g., $2 + 2 + 2 = 3 \times 2$ ).
<b>Rotation:</b>	A transformation that maps every point in the plane to its image by rotating the plane around a fixed point or line.
<b>Scientific calculator:</b>	A calculator that represents very large or very small numbers in scientific notation and with the powering, factorial, square root, negative and reciprocal keys.
<b>Scientific notation:</b>	A way of writing a number of terms of an integer power of 10 multiplied by a number greater than or equal to 1 and less than 10.
<b>Sequence:</b>	A set of ordered quantities (e.g., positive integers).
<b>Series:</b>	The indicated sum of the terms of a sequence.
<b>Similarity:</b>	Having the same shape but not necessarily the same size.

- Simple event:** An event whose probability can be obtained from consideration of a single occurrence (e.g., the tossing of a coin is a simple event).
- Simulation:** Modeling a real event without actually observing the event.
- Slope:** The slope of a line is the ratio of the change in  $y$  to the corresponding change in  $x$ ; the constant  $m$  in the linear function equation; rise/run.
- Standard deviation:** The square root of the variance.
- Stem-and-leaf plot:** A frequency distribution made by arranging data (e.g., student scores on a test were 98, 96, 85, 93, 83, 87, 85, 87, 93, 75, 77 and 83. This data are displayed in a stem-and-leaf plot below.

9	8, 6, 3, 3
8	7, 7, 5, 5, 3, 3
7	7, 5

- Systems of equations:** Two or more equations that are conditions imposed simultaneously on all the variables, but may or may not have common solutions (e.g.,  $x + y = 2$ , and  $3x + 2y = 5$ ).
- Symmetry:** A line of symmetry separates a figure into two congruent halves, each of which is a reflection of the other (e.g.,  $\emptyset$ , the line through the center of the circle divides it into congruent halves).
- t-test:** A statistical test done to test the difference of means of two samples.
- Tessellation:** A repetitive pattern of polygons that covers an area with no holes and no overlaps, like floor tiles.
- Transformation:** An operation on a geometric figure by which each point gives rise to a unique image.
- Translation:** A transformation that moves a geometric figure by sliding each of the points the same distance in the same direction.
- Tree diagram:** A diagram used to show the total number of possible outcomes in a probability experiment.
- Trigonometric functions:** A function (e.g., sine, cosine, tangent, cotangent, secant, cosecant) whose independent variable is an angle measure, usually in degrees or radians.
- Valid argument:** An argument with the property no matter what statements are substituted in the premises, the truth value of the form is true. If the premises are true, then the conclusion is true.
- Variable:** A symbol used to stand for any one of a given set of numbers or other objects (e.g., in the equation  $y = x + 5$ ,  $y$  and  $x$  are variables).
- Variance:** In a data set, the sum of the squared deviations divided by one less than the number of elements in the set (sample variance  $s^2$ ) or by the number of elements in the set (population variance  $\sigma^2$ ).
- Vector:** A quantity that has both magnitude and direction (e.g., physical quantities such as velocity and force).
- Venn diagram:** A display that pictures unions and intersections of sets.



- Volume:** The amount of space enclosed in a space (3-dimensional) figure, measured in cubic units.
  - Y-intercept:** The  $y$ -intercept of a line is the  $y$ -coordinate of the point at which the graph of an equation crosses the  $y$ -axis.
  - $\pi$ : pi, the ratio of the circumference of a circle to its diameter: about 3.1415926535.
- CHAPTER 5. (Reserved)**
- §§ 5.1—5.4. (Reserved).
  - §§ 5.201—5.203. (Reserved).
  - §§ 5.211—5.220. (Reserved).
  - §§ 5.221—5.223. (Reserved).
  - § 5.231. (Reserved).
  - § 5.232. (Reserved).
  - §§ 5.241—5.244. (Reserved).
  - §§ 5.251—5.253. (Reserved).

- CHAPTER 6. (Reserved)**
- §§ 6.1—6.3. (Reserved).
  - §§ 6.21—6.23. (Reserved).
  - § 6.52. (Reserved).
  - § 6.63. (Reserved).
  - § 6.71. (Reserved).
  - § 6.81. (Reserved).

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