Mathematics

Assessment Anchors and Eligible Content

Aligned to the Pennsylvania Core Standards

Grade 8

Pennsylvania Department of Education

www.pdesas.org www.education.state.pa.us

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Pennsylvania System of School Assessment

The Assessment Anchors, as defined by the Eligible Content, are organized into cohesive blueprints, each structured with a common labeling system that can be read like an outline. This framework is organized first by Reporting Category, then by Assessment Anchor, followed by Anchor Descriptor, and then finally, at the greatest level of detail, by an Eligible Content statement. The common format of this outline is followed across the PSSA.

Here is a description of each level in the labeling system for the PSSA:

Reporting Category

The Assessment Anchors are organized into four classifications, as listed below.

- A = Numbers and Operations
- B = Algebraic Concepts
- C = Geometry
- D = Data Analysis and Probability

These four classifications are used throughout the grade levels. In addition to these classifications, there are five Reporting Categories for each grade level. The first letter of each Reporting Category represents the classification; the second letter represents the Domain as stated in the Pennsylvania Core Standards for Mathematics. Listed below are the Reporting Categories for Grade 8.

- A-N = The Number System
- B-E = Expressions and Equations
- B-F = Functions
- C-G = Geometry
- D-S = Statistics and Probability

The title of each Reporting Category is consistent with the title of the corresponding Domain in the Pennsylvania Core Standards for Mathematics. The Reporting Category title appears at the top of each page.

Assessment Anchor

The Assessment Anchor appears in the shaded bar across the top of each Assessment Anchor table. The Assessment Anchors represent categories of subject matter (skills and concepts) that anchor the content of the PSSA. Each Assessment Anchor is part of a Reporting Category and has one or more Anchor Descriptors unified under and aligned to it.

Anchor Descriptor

Below each Assessment Anchor is one or more specific Anchor Descriptors. The Anchor Descriptor adds a level of specificity to the content covered by the Assessment Anchor. Each Anchor Descriptor is part of an Assessment Anchor and has one or more Eligible Content statements unified under and aligned to it.

Eligible Content

The column to the right of the Anchor Descriptor contains the Eligible Content statements. The Eligible Content is the most specific description of the skills and concepts assessed on the PSSA. This level is considered the assessment limit and helps educators identify the range of the content covered on the PSSA.

Reference

In the space below each Assessment Anchor table is a code representing one or more Pennsylvania Core Standards for Mathematics that correlate to the Eligible Content statements.

M08.A-N The Number System

Reporting Category

ASSESSMENT ANCHOR			
M08.A-N.1	**Demonstrate an understanding of rational and irrational numbers.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.A-N.1.1	Apply concepts of rational and irrational numbers.	**M08.A-N.1.1.1**	Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths).
		M08.A-N.1.1.2	Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths).
		M08.A-N.1.1.3	Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). *Example:* $\sqrt{5}$ *is between 2 and 3 but closer to 2.*
		M08.A-N.1.1.4	Use rational approximations of irrational numbers to compare and order irrational numbers.
		M08.A-N.1.1.5	Locate/identify rational and irrational numbers at their approximate locations on a number line.

Reference:

CC.2.1.8.E.1

Distinguish between rational and irrational numbers using their properties.

CC.2.1.8.E.4

Estimate irrational numbers by comparing them to rational numbers.

M08.B-E Expressions and Equations — Reporting Category

ASSESSMENT ANCHOR

M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.

DESCRIPTOR		ELIGIBLE CONTENT	
M08.B-E.1.1	Represent and use expressions and equations to solve problems involving radicals and integer exponents.	**M08.B-E.1.1.1**	Apply one or more properties of integer exponents to generate equivalent numerical expressions without a calculator (with final answers expressed in exponential form with positive exponents). **Properties will be provided.** *Example:* $3^{12} \times 3^{-15} = 3^{-3} = 1/(3^3)$
		M08.B-E.1.1.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of perfect squares (up to and including 12^2) and cube roots of perfect cubes (up to and including 5^3) without a calculator. *Example: If $x^2 = 25$ then $x = \pm\sqrt{25}$.*
		M08.B-E.1.1.3	Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another. *Example: Estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 and determine that the world population is more than 20 times larger than the United States' population.*
		M08.B-E.1.1.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7×10^9).

Reference:

CC.2.2.8.B.1

Apply concepts of radicals and integer exponents to generate equivalent expressions.

M08.B-E Expressions and Equations — Reporting Category

ASSESSMENT ANCHOR			
M08.B-E.2	**Understand the connections between proportional relationships, lines, and linear equations.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.B-E.2.1	Analyze and describe linear relationships between two variables, using slope.	**M08.B-E.2.1.1**	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
		M08.B-E.2.1.2	Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
		M08.B-E.2.1.3	Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

Reference:

CC.2.2.8.B.2

Understand the connections between proportional relationships, lines, and linear equations.

M08.B-E Expressions and Equations — Reporting Category

ASSESSMENT ANCHOR

M08.B-E.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

DESCRIPTOR		ELIGIBLE CONTENT	
M08.B-E.3.1	Write, solve, graph, and interpret linear equations in one or two variables, using various methods.	**M08.B-E.3.1.1**	Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
		M08.B-E.3.1.2	Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
		M08.B-E.3.1.3	Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs because points of intersection satisfy both equations simultaneously.
		M08.B-E.3.1.4	Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. *Example: 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*
		M08.B-E.3.1.5	Solve real-world and mathematical problems leading to two linear equations in two variables. *Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Reference:

CC.2.2.8.B.3
Analyze and solve linear equations and pairs of simultaneous linear equations.

M08.B-F Functions — Reporting Category

ASSESSMENT ANCHOR			
M08.B-F.1	**Analyze and interpret functions.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.B-F.1.1	Define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions.	**M08.B-F.1.1.1**	Determine whether a relation is a function.
		M08.B-F.1.1.2	Compare properties of two functions, each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). *Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
		M08.B-F.1.1.3	Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear.

Reference:

CC.2.2.8.C.1
Define, evaluate, and compare functions.

M08.B-F Functions

Reporting Category

ASSESSMENT ANCHOR

M08.B-F.2 Use functions to model relationships between quantities.

	DESCRIPTOR		ELIGIBLE CONTENT
M08.B-F.2.1	Represent or interpret functional relationships between quantities using tables, graphs, and descriptions.	**M08.B-F.2.1.1**	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
		M08.B-F.2.1.2	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally.

Reference:

CC.2.2.8.C.2

Use concepts of functions to model relationships between quantities.

M08.C-G Geometry — Reporting Category

ASSESSMENT ANCHOR			
M08.C-G.1	**Demonstrate an understanding of geometric transformations.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.C-G.1.1	Apply properties of geometric transformations to verify congruence or similarity.	**M08.C-G.1.1.1**	Identify and apply properties of rotations, reflections, and translations. *Example: Angle measures are preserved in rotations, reflections, and translations.*
		M08.C-G.1.1.2	Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them.
		M08.C-G.1.1.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
		M08.C-G.1.1.4	Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.

Reference:

CC.2.3.8.A.2
Understand and apply congruence, similarity, and geometric transformations using various tools.

M08.C-G Geometry — Reporting Category

ASSESSMENT ANCHOR			
M08.C-G.2	**Understand and apply the Pythagorean theorem.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.C-G.2.1	Solve problems involving right triangles by applying the Pythagorean theorem.	**M08.C-G.2.1.1**	Apply the converse of the Pythagorean theorem to show a triangle is a right triangle.
		M08.C-G.2.1.2	Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Figures provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.)
		M08.C-G.2.1.3	Apply the Pythagorean theorem to find the distance between two points in a coordinate system.

Reference:

CC.2.3.8.A.3
Understand and apply the Pythagorean Theorem to solve problems.

M08.C-G Geometry — Reporting Category

ASSESSMENT ANCHOR			
M08.C-G.3	**Solve real-world and mathematical problems involving volume.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.C-G.3.1	Apply volume formulas of cones, cylinders, and spheres.	**M08.C-G.3.1.1**	Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. **Formulas will be provided.**

Reference:

CC.2.3.8.A.1

Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems.

M08.D-S Statistics and Probability — Reporting Category

ASSESSMENT ANCHOR

M08.D-S.1 Investigate patterns of association in bivariate data.

DESCRIPTOR		ELIGIBLE CONTENT	
M08.D-S.1.1	Analyze and interpret bivariate data displayed in multiple representations.	**M08.D-S.1.1.1**	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association.
		M08.D-S.1.1.2	For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line.
		M08.D-S.1.1.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *Example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

Reference:

CC.2.4.8.B.1

Analyze and/or interpret bivariate data displayed in multiple representations.

M08.D-S Statistics and Probability — Reporting Category

ASSESSMENT ANCHOR			
M08.D-S.1	**Investigate patterns of association in bivariate data.**		
	DESCRIPTOR		**ELIGIBLE CONTENT**
M08.D-S.1.2	Understand that patterns of association can be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.	**M08.D-S.1.2.1**	Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible associations between the two variables. *Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores?*

Reference:

CC.2.4.8.B.2
Understand that patterns of association can be seen in bivariate data utilizing frequencies.