

Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Geometry		Grade Level: Geometry
G.G.GPE.A Cluster: Translate between the geometric description and the equation for a conic section.		
The introduction of coordinates into geometry connects geometry and algebra, allowing algebraic proofs of geometric theorems.		
<p>**This is a ADDITIONAL cluster. <i>Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.</i></p> <p>G.G.GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.</p>		
Aspects of Rigor: (Conceptual, Procedural, and/or Application)		
G.G.GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.		
Conceptual Understanding	Procedural Fluency	Application
A circle can be described by its center and radius.	Use the Pythagorean Theorem to write an equation of a circle.	
The equation of a circle can be written using center and radius.	Complete the square to transform an equation of a circle into standard form.	
Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices		
<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. <ul style="list-style-type: none"> Learners must be challenged to develop deep understanding through exploring a range of tasks that require problem solving. Make sense of formulas and the relationships among them. 2. Reason abstractly and quantitatively <ul style="list-style-type: none"> Justifying formulas will move learners from concrete to abstract thinking. Reason quantitatively about coordinates and their relationship to properties. Ensure reasonableness of answers. 3. Construct viable arguments and critique the reasoning of others. <ul style="list-style-type: none"> A central focus is constructing viable arguments about formulas in order to avoid ambiguity. 4. Model with mathematics. <ul style="list-style-type: none"> Use coordinates to model geometric situations and generalize to formulas i.e. distance, slope. 5. Use appropriate tools strategically. <ul style="list-style-type: none"> Use appropriate tools such as graph paper and dynamic geometry software to explore possible relationships. 6. Attend to precision. 		

- Correctly apply procedures i.e distance, completing the square.
 - Determine appropriate level of precision (exact answer vs. rounding).
 - Use precise language to describe relationships.
- 7. Look for and make use of structure.**
- Learners explore patterns and consider the structure of relationships within the coordinate plane in order to form generalizations.
 - Look for relationships of parts in order to determine perimeters and areas.
- 8. Look for and express regularity in repeated reasoning.**
- Learners can connect algebraic operations with visual representations (i.e. distance and subtraction, midpoint and average).

Vertical and Horizontal Coherence and Learning Progressions

<u><i>Previous Learning Connections</i></u>	<u><i>Current Learning Connections</i></u>	<u><i>Future Learning Connections</i></u>
Learners have worked with coordinates and slope in 8th grade math. Learners have used the Pythagorean Theorem to determine distance on the coordinate plane. (8.G.8) Exploring facts about right triangles leads to foundational formulas in analytic geometry. Learners have been rewriting expressions in different forms (factoring and completing the square) in Algebra 1 (A.SSE.2, A.SSE.3)	Learners extend precise definitions of circles and polygons to work with coordinates on the plane.	Learners will continue with graphing quadratic functions, showing vertices, intercepts, and identifying maxima or minima (F.IF.7, F.IF.8, A.REI.4).

Vocabulary (key terms and definitions)

- center of circle
- Pythagorean Theorem
- completing the square
- derive

Relevance, Explanations, and Examples:

When applying the power of analytic geometry to reduce geometric relationships to algebraic ones, be careful that learners do not lose sight of the geometric meaning of the formulas.

Achievement Level Descriptors

Cluster: Translate between the geometric description and the equation for a conic section.

Concepts and Procedures	Level 1: Students should be able to base arguments on concrete referents such as objects, drawings, diagrams, and actions and identify obvious flawed arguments in familiar contexts.
	Level 2: Students should be able to find and identify the flaw in an argument by using examples or particular cases. Students should be able to break a familiar argument given in a highly scaffolded situation into cases to determine when the argument does or does not hold.
	Level 3: Students should be able to use stated assumptions, definitions, and previously established results and examples to test and support their reasoning or to identify, explain, and repair the flaw in an argument. Students should be able to break an argument into cases to determine when the argument does or

does not hold.

Level 4: Students should be able to use stated assumptions, definitions, and previously established results to support their reasoning or repair and explain the flaw in an argument. They should be able to construct a chain of logic to justify or refute a proposition or conjecture and to determine the conditions under which an argument does or does not apply.