

# 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.

<b>Domain: Algebra</b>		<b>Grade Level: 4th Year</b>
<b>HS4.A.APR.A Cluster: Use polynomial identities to solve problems</b>		
Use the Binomial Theorem to expand binomial expressions such as $(a+b)^3$ , using Pascal's Triangle.		
<p><b>This is a SUPPORTING cluster.</b> 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.</p> <p><b>A.APR.5.</b> Know and apply the Binomial Theorem for the expansion of <math>(x + y)^n</math> in powers of <math>x</math> and <math>y</math> for a positive integer <math>n</math>, where <math>x</math> and <math>y</math> are any numbers, with coefficients determined for example by Pascal's Triangle.</p>		
<b>Aspects of Rigor of Student Learning: (Conceptual, Procedural, and/or Application)</b>		
<b>A.APR.5.</b> Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of $x$ and $y$ for a positive integer $n$ , where $x$ and $y$ are any numbers, with coefficients determined for example by Pascal's Triangle.		
<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
Experiment with Pascal's Triangle and with products of powers of binomials such as $(x+1)^0$ , $(x+1)^1$ , $(x+1)^2$ , and so on, to establish the Binomial Theorem.	Apply the Binomial Theorem to expand polynomials such as $(3x+1)^4$ without multiplying the entire expression with the distributive property.	
<b>Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices</b>		
<ol style="list-style-type: none"> <li><b>1. Make sense of problems and persevere in solving them.</b></li> <li><b>2. Reason abstractly and quantitatively.</b> <ul style="list-style-type: none"> <li>Extending previous learning about multiplying two binomial expressions to more complex identities.</li> </ul> </li> <li><b>3. Construct viable arguments and critique the reasoning of others.</b></li> <li><b>4. Model with mathematics.</b></li> <li><b>5. Use appropriate tools strategically.</b></li> <li><b>6. Attend to precision.</b></li> <li><b>7. Look for and make use of structure.</b> <ul style="list-style-type: none"> <li>Learners see how Pascal's Triangle is applied in creating expressions.</li> </ul> </li> <li><b>8. Look for and express regularity in repeated reasoning.</b> <ul style="list-style-type: none"> <li>Learners look for patterns in numerical relationships and then describe them.</li> </ul> </li> </ol>		
<b>Vertical and Horizontal Coherence and Learning Progressions</b>		

<b>Previous Learning Connections</b>	<b>Current Learning Connections</b>	<b>Future Learning Connections</b>
<p>Learners work with exponents, multiplying factors, and the distributive property in previous algebra courses. Students may have used this concept while studying probability to better understand permutations and combinations.</p>	<p>Learners will be working in the 4th year course on writing expressions in equivalent forms.</p>	<p>Learners will see this concept in a Statistics and Probability course. Students will also see this concept in a College Algebra and/or College Precalculus course.</p>
<p><b>Vocabulary (key terms and definitions)</b></p>		
<ul style="list-style-type: none"> <li>● Factorial</li> <li>● Binomial Theorem</li> <li>● Pascal's Triangle</li> </ul>		
<p><b>Relevance, Explanations, and Examples:</b></p>		
<p>Expand <math>(3x+1)^4</math> without multiplying using the distributive property. Find the fourth term in <math>(ax+by)^n</math>.</p>		