Richmond Public Schools
Curriculum Framework
Grade 8

Strand: Number and Number Sense

8.3 The student will
  a) estimate and determine the two consecutive integers between which a square root lies; and
  b) determine both the positive and negative square roots of a given perfect square.

Suggested Pacing
First Nine Weeks – 3 Instructional Days (including common assessment)

Related Standards	

Spiral Down
7.1 The student will
   d) determine square roots of perfect squares.
	Spiral Up
	A.3 The student will simplify
	   a) square roots of whole numbers and monomial algebraic expressions;
	   b) cube roots of integers; and
	   c) numerical expressions containing square or cube roots

Essential Questions	Common Misconceptions
How does the area of a square relate to the square of the number? *The area determines the perfect square number. If it is not a perfect square, the area provides a means for estimation.* **Why do numbers have both positive and negative roots?** *The square root of a number is any number which when multiplied by itself equals the number. A product, when multiplying two positive factors, is always the same as the product when multiplying their opposites (eg. 7 × 7 = 49 and -7 × -7 = 49).*	● Students need to make a connection with side lengths and area. ● Students may divide the area by 4 (perimeter) instead of finding the square root when determining side length. ● Students need reminders for identifying two <u>consecutive</u> integers for square roots. ● Students need to make connections with identifying estimations of square roots on a number line.

Understanding the Standard	Essential Knowledge and Skills

- A perfect square is a whole number whose square root is an integer.

- The square root of a given number is any number which, when multiplied times itself, equals the given number.

- Both the positive and negative roots of whole numbers, except zero, can be determined. The square root of zero is zero. The value is neither positive nor negative. Zero (a whole number) is a perfect square.

- The positive and negative square root of any whole number other than a perfect square lies between two consecutive integers (e.g., $\sqrt{57}$ lies between 7 and 8 since $7^2 = 49$ and $8^2 = 64$; $-\sqrt{11}$ lies between -4 and -3 since $(-4)^2 = 16$ and $(-3)^2 = 9$).

- The symbol $\sqrt{}$ may be used to represent a positive (principal) root and $-\sqrt{}$ may be used to represent a negative root.

- The square root of a whole number that is not a perfect square is an irrational number (e.g., $\sqrt{2}$ is an irrational number). An irrational number cannot be expressed exactly as a fraction $\frac{a}{b}$ where b does not equal 0.

- Square root symbols may be used to represent solutions to equations of the form $x^2 = p$. Examples may include:
  - If $x^2 = 36$, then x is $\sqrt{36} = 6$ or $-\sqrt{36} = -6$.
  - If $x^2 = 5$, then x is $\sqrt{5}$ or $-\sqrt{5}$.

- Students can use grid paper and estimation to determine what is needed to build a perfect square. The square root of a positive number is usually defined as the side length of a square with the area equal to the given number. If it is not a perfect square, the area provides a means for estimation.

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Estimate and identify the two consecutive integers between which the positive or negative square root of a given number lies. Numbers are limited to natural numbers from 1 to 400. (a)

- Determine the positive or negative square root of a given perfect square from 1 to 400. (b)

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Vocabulary	Instructional Activities Organized by Learning Objective

Perfect Square
Whole Number
Natural Number
Square Root
Integer
Positive and Negative Roots
Consecutive
Radical
Irrational Number
Side Length
Area
Estimation
	Virginia Department of Education
	Perfect Squares and Square Roots – Lesson Plan
	
	Textbook
	Virginia Pre-Algebra, ©2012, Glencoe/McGraw-Hill
	   ● Perfect Squares and Square Roots Lab, page(s) 553 – 554
	   ● Squares and Square Roots, page(s) 555 – 560
	
	Notes
	   ● Square Roots
	
	Resources
	   ● **Print**
	      Virginia Coach, NEW SOL Edition, Grade 8, Mathematics
	         Lesson 2 – page 13 (Square Roots)

Assessment	

RPS PowerSchool Unit Test – RPS 8.3 Common Assessment
Test ID#:
 	
Formative Assessments
White Board Checks
Kahoot.it
Plickers
Exit Tickets
Graphic Organizers
Venn Diagrams
	● **Technology-based**
	      ○ *Explorelearning.com (Gizmos)* – *Square Roots* – Interactive Lesson *Sign-in required*
	      ○ *LearnAlberta.ca* – Exploring Square Roots – Interactive Lesson *Worksheet*
	
	Station Activities
	   ● Cheez-It Activity (The Numberline, answer key -example)
	      o Worksheet link included in "The Numberline" link
	   ● Carousel - Have students walk around the class and answer questions about real numbers posted around the classroom.
	   ● Task Cards - Have students complete problems in small groups Think-Pair-Share.

Cross-Curricular Connections	Differentiations
English Students can explain how perfect squares and estimates are found on a number line, using complete sentences. **Design** Students learn how square roots are used to build structures including ramps in skateparks. Video	● Have students create a number line, and line up perfect squares with its root. ● Have students use the number line from above to show what two integers non-perfect square numbers lie between. ● Have students use graph paper to draw squares, and find the area. Discuss how area relates to perfect squares. ● Give students a multiplication table, indicate to students to multiply 4 by 4 and find the product. Have students repeat with other root numbers. Discuss diagonal pattern formed.