EaD Comprehensive Lesson Plans

Strand:	Number	**Sub-Strand:**	Number Operations
Content Standard:	B9.1.2.4 Demonstrate understanding of surds as real numbers, the process of adding and subtracting of surds as well as determining (using a calculator) the approximate square root of a number that is not a perfect square.		

BASIC 9

WEEKLY LESSON PLAN – WEEK 6

Indicator (s)	B9.1.2.4.1 Identify simple and compound surds. B9.1.2.4.2 Explain the identities/rules of surds B9.1.2.4.3 Simplify given surds B9.1.2.4.4 Approximate the square roots of non-perfect squares with calculators/ tables.	**Performance Indicator:** Learners can apply the rules of surds.
Week Ending	18-10-2024	

Class	B.S.9	**Class Size:**		**Duration:**	
Subject	Mathematics				
Reference	Mathematics Curriculum, Teachers Resource Pack, Learners Resource Pack, Textbook.				

Teaching / Learning Resources	Poster, Video	**Core Competencies:**	• Demonstrate behaviour and skills of working towards group goals • Ability to select alternative(s) that adequately meet selected criteria

DAYS/DATE	**PHASE 1 : STARTER**	**PHASE 2: MAIN**	**PHASE 3: REFLECTION**
MONDAY	Discuss with the Learners about the meaning of "Surds".	1. Assist Learners to identify the rules of working with Surds. 2. Demonstrate for the Learners to observe the steps to follow to simplify surds. 3. Assist Learners to solve some interactive questions on Surds. 4. Learners brainstorm to differentiate between simple and compound Surds. **Rules of Surds;** • Surds cannot be added. $\sqrt a + \sqrt b \neq \sqrt{(a + b)}$ • Surds cannot be subtracted. $\sqrt a - \sqrt b \neq \sqrt{(a - b)}$ • Surds can be multiplied. $\sqrt a \times \sqrt b = \sqrt{(a \times b)}$ • Surds can be divided. $\frac{\sqrt a}{\sqrt b} = \sqrt\frac{a}{b}$ • Surds can be written in exponential form. \[\begin{align} \sqrt a &=	Through questions and answer, conclude the lesson. **Exercise;** 1. What are surds in math? Surds definition in math refers to the numbers that do not have answers to their roots. A few examples of surds as $\sqrt5,~ \sqrt[3]7,~ 2 +\sqrt3,~ \sqrt6 + 2\sqrt3$. 2. How to rationalize surds? To rationalize a surd we need to multiply the surd with its conjugate surd. To rationalize $\sqrt5$ we need to multiply it with $\sqrt5$. $\sqrt5 \times \sqrt5 = 5$ 3. How to solve surds? To solve an expression in surds form we need to take prime

		a^{\frac{1}{2}} \\ \sqrt[n] a&= a^{\frac{1}{n}}\end{align}\] **Simplify Surd Calculation with Steps** Simplification of surds is needed for performing calculations. There are two simple steps to surd simplification. **STEP - 1:** Split the number within the root into its prime factors. \[\sqrt50 = \sqrt(5 \times 5 \times 2) \] **STEP-II:** Based on the root write the prime factors, outside the root. In case of square root, write one factor outside the root, for every two similar factors within the root. \[\sqrt(5 \times 5 \times 2) = 5\sqrt 2 \] **Example** Let us use the above steps to perform the following calculation. \[\sqrt 18 + \sqrt50 \] The above operation of addition is not possible without further simplification. \[\begin{align}\sqrt18 + \sqrt50&= \sqrt (3 \times 3 \times 2) + \sqrt(5 \times 5 \times 2) \\ &= 3\sqrt2 + 5\sqrt2 \\ &=8\sqrt2\end{align} \]	factors of the number within the surd. Further, it is simplified by taking the possible prime factors outside the root symbol. \[\sqrt18 = \sqrt(3 \times 3 \times 2) = 3\sqrt2 \] 4. What is a surd example? Some of the surds examples are \(\sqrt11,~ 5\sqrt3,~ 17 + \sqrt3,~ \sqrt5 + \sqrt10\) 5. Can surds have negative numbers?
WEDNESDAY	Review Learners knowledge on how to simplify Surds.	1. Engage Learners in applying addition and subtraction Surds rules to solve more questions. 2. Demonstrate on applying the multiplication rule of Surds. 3. Assist Learners to practice solving more examples of applying addition, subtraction and division rules of Surds. **Addition and Subtraction of Surds** Only like surds can be added or subtracted. *Examples* 1. Simplify 85–√−35–√85−35.	Reflect on applying Surds rules. **Exercise;** 1. (a) Write √45 in the form a √5, where a is an integer. (b) Express 2(3 + √5)(2 + √5) in the form b + c√5, where b and c are integers. 2. (a) Expand and simplify (4 + √3)(4 - √3). (b) Express 26/(4+√3) in the form a + b√3, where a and b are integers. 3. (a) Express √108 in the form a√3, where a in an

		85–√−35–√=55–√(just as 8x−5x=5x .) 2. Simplify 23–√+57–√−103–√23+57−103. 23–√+57–√−103–√=57–√−83–√(just as 2x+5y−10x=5y−8x.) 23+57−103 =57−83(just 3. Simplify 18−−√−8–√−20−−√18−8−20 18−−√−8–√−20−−√=9×2−−−−√−4×2−−−−√−4×5−−−−√=32–√−22–√−25–√=2–√−25–√.18−8−20=9×2−4×2−4×5=32−22−25=2−25. Note that 2–√−25–√2−25 cannot be simplified because 2–√2 and 5–√5 are not like surds. **Multiplication of Surds** The following rule can be used to multiply terms containing surds: ab√×cd−−√=acbd *Examples* 1. Simplify 2–√×3–√.2×3. 2–√×3–√=6–√.2×3=6. 2. Simplify 33–√×45–√33×45. 33–√×45–√=1215−−√.33×45=1215. 3. Simplify 210−−√×76–√210×76. 210−−√×76–√=1460−−√ (which can be simplified further)=144×15−−−−−√=14×215−−√=2815−−√	integer. (b) Express $(2 - √3)^2$ in the form b + c√3 where b and c integers to be found. 4. Simplify (3 + √5)(3 - √5) 5. Simplify (5 - √3)/(2 + √3) giving your answer in the form a + b√3, where a and b are integers.
FRIDAY	Learners brainstorm to identify examples of perfect and non-perfect squares.	1. Demonstrate on how to find the square root of perfect and non-perfect squares. 2. Discuss the formula for calculating the square root of a number with the Learners. 3. Assist Learners to calculate on finding square roots of perfect and non-perfect squares. 4. Discuss with the Learners about four (4) methods to find the	Learners brainstorm to simplify square root of numbers. **Exercise;** Calculate the square and square root of the following numbers. a) Square root of 25 is ___

		square root of a number without using a calculator. **Square Root Definition** The square root of a number is the value of power 1/2 of that number. In other words, it is the number whose product by itself gives the original number. It is represented using the symbol '√ '. The square root symbol is called a radical, whereas the number under the square root symbol is called the radicand. How to Find Square Root? To find the square root of a number, we just see by squaring which number would give the actual number. It is very easy to find the square root of a number that is a perfect square. Perfect squares are those positive numbers that can be expressed as the product of a number by itself. In other words, perfect squares are numbers which are expressed as the value of power 2 of any integer. We can use ***four methods to find the square root of numbers*** and those methods are as follows: • Repeated Subtraction Method • Prime Factorization Method • Estimation Method • Long Division Method It should be noted that the first three methods can be conveniently used for perfect squares, while the fourth method, i.e., the long division method can be used for any number whether it is a perfect square or not. **Repeated Subtraction Method of Square Root** This is a very simple method. We subtract the consecutive odd numbers from the number for which we are finding the square root, till we reach 0. The number of times we subtract is the square root of the given number. This method works only for perfect square numbers. Let us find the square root of 16 using this method.	b) Square of 16 is ____ c) Square of 20 is ____ d) Square root of 400 is ______

- 16 - 1 = 15
- 15 - 3 =12
- 12 - 5 = 7
- 7- 7 = 0

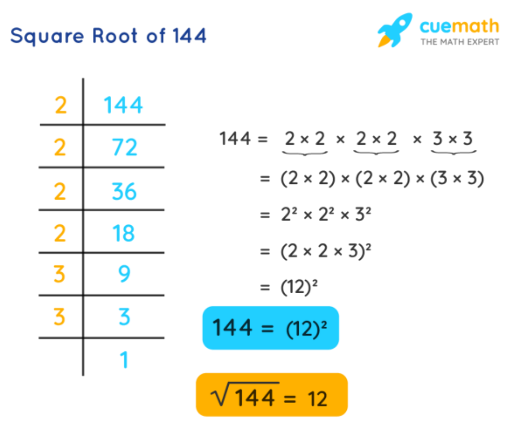
You can observe that we have subtracted 4 times. Thus,√16 = 4

Square Root by Prime Factorization Method

Prime factorization of any number means to represent that number as a product of prime numbers. To find the square root of a given number through the prime factorization method, we follow the steps given below:

- **Step 1:** Divide the given number into its prime factors.
- **Step 2:** Form pairs of factors such that both factors in each pair are equal.
- **Step 3:** Take one factor from the pair.
- **Step 4:** Find the product of the factors obtained by taking one factor from each pair.
- **Step 5:** That product is the square root of the given number.

Let us find the square root of 144 by this method.

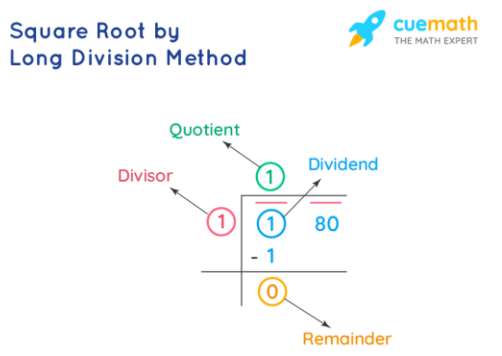
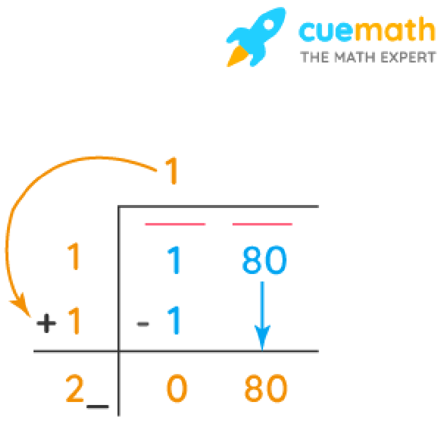
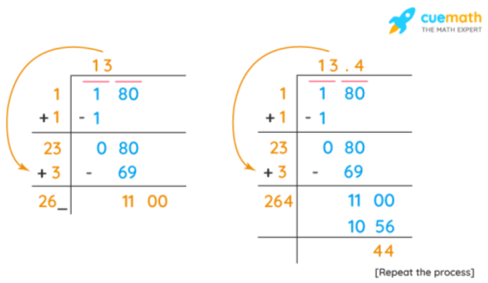


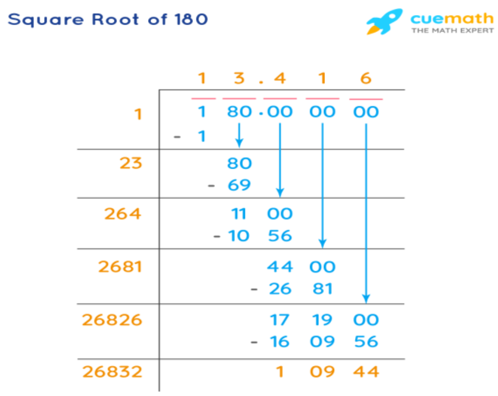
This method works when the given number is a perfect square number.

Finding Square Root by Estimation Method

Estimation and approximation refer to a reasonable guess of the actual value to make calculations easier and more

		realistic. This method helps in estimating and approximating the square root of a given number. Let us use this method to find √15. Find the nearest perfect square number to 15. 9 and 16 are the perfect square numbers nearest to 15. We know that √16 = 4 and √9 = 3. This implies that √15 lies between 3 and 4. Now, we need to see if √15 is closer to 3 or 4. Let us consider 3.5 and 4. Since $3.5^2 = 12.25$ and $4^2 = 16$. Thus, √15 lies between 3.5 and 4 and is closer to 4. Let us find the squares of 3.8 and 3.9. Since $3.8^2 = 14.44$ and $3.9^2 = 15.21$. This implies that √15 lies between 3.8 and 3.9. We can repeat the process and check between 3.85 and 3.9. We can observe that √15 = 3.872. This is a very long process and time-consuming. **Calculating Square Root by Long Division Method** Long division is a method for dividing large numbers into steps or parts, breaking the division problem into a sequence of easier steps. We can find the exact square root of any given number using this method. Let us understand the process of finding square root by the long division method with an example. Let us find the square root of 180. • **Step 1:** Place a bar over every pair of digits of the number starting from the units' place (right-most side). We will have two pairs, i.e., 1 and 80 • **Step 2:** We divide the left-most number by the largest number whose square is less than or equal to the number in the left-most pair.	

		 **Step 3:** Bring down the number under the next bar to the right of the <u>remainder</u>. Add the last digit of the <u>quotient</u> to the <u>divisor</u>. To the right of the obtained sum, find a suitable number which, together with the result of the sum, forms a new divisor for the new dividend that is carried down.  **Step 4:** The new number in the quotient will have the same number as selected in the divisor. The condition is the same — as being either less than or equal to the dividend. **Step 5:** Now, we will continue this process further using a decimal point and adding zeros in pairs to the remainder.  **Step 6:** The quotient thus obtained will	

		be the square root of the number. Here, the square root of 180 is approximately equal to 13.4 and more digits after the decimal point can be obtained by repeating the same process as follows.  	

Name of Teacher: **School:** **District:**