SQUARES AND SQUARE ROOTS OF NUMBERS

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Subject

Mathematics

Prepared By

[Instructor Name]

Grade Level

3

Overview

This lesson plan covers teaching content for;

1. Understanding the concept of squares, perfect squares and square roots.
2. Finding the square of 2-digit numbers
3. Algorithms for solving square root of numbers
4. Determining if a number is a perfect square or not.
5. Word problems and quantitative reasoning.

Objectives

Students should be able to;

1. Understand the meaning of the terms 'square number' and 'square root'.
2. Find the square of 1- and 2-digit numbers
3. Identify objects with perfect faces
4. Find the square root of perfect squares up to 400
5. Solve quantitative reasoning problems of squares and square roots of perfect squares

Guided Practice

Day 2/ Lesson 2: 15 Mins

1. Remind students the definition of square roots. The square root is just the opposite of the square.
2. Square root of a number, n (i.e. $\sqrt{n}$) is the number that

Activity Starter/Instruction

The teacher explains that:

1. The square of a number is the number times itself. For example, the square of 3 is 3x3. The square of 4 is 4x4.
2. To show that a number is squared, a small 2 is placed to the top right of the number. Like this:

   4^2 7^2 3^2 X^2

3. These signs are the same as saying "3 squared, 4 squared, and x squared."
4. This is also called a superscript or the power of the number. The number to the "power of 2" is the same as the number "squared" or the "square" of the number.
5. The square root is just the opposite of the square. You can think of it as the "root" of the square or the number that was used to make the square.

   3^2 = 9 here, 9 = square, 3 = square root

6. The sign for square root looks like this: √

Teacher Guide

Day 1/ Lesson 1: 15 Mins

1. The teacher explains that When you multiply a number by itself, it is called squaring a number. So, if we square 3, we would have 3 x 3. Since, 3 x 3 = 9, we can say that if we square the number 3, we get 9!
2. If we take a look at a square shape, we see that that a square has equal side lengths! So, if we multiply the side lengths, we get len x len = square. E.g. a square paper of length 4cm gives 4 x 4 = 16
3. Use a square chart to explain to students how the square of a number can be derived.
4. Write the following squares for better understanding.

   4 x 4 = 4^2 = 16
   5 x 5 = 5^2 = 25
   6 x 6 = 6^2 = 32
   7 x 7 = 7^2 = 49
   8 x 8 = 8^2 = 64
   9 x 9 = 9^2 = 81
   10 x 10 = 10^2 = 100

Materials Required

- White Board
- Square sheets
- scissors
- Pencils
- Square chart
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Additional Resources

- https://za.pearson.com/content/dam/region-growth/africa/TeacherResourceMaterial/9781447978411_ngr
- https://www.ducksters.com/kidsmath/square_and_sc
- https://www.math.com/school/subject1/lessons/S1U
- http://www.ask-math.com/perfect-squares.html

Additional Notes

gives you n when you multiply the number by itself.

$\sqrt{n}$ = the number that gives n when multiplied by itself.

E.g. $\sqrt{25} = 5$ because $5 \times 5 = 25$.

Here are examples:

$\sqrt{4} = 2$ since $2^2 = 4$

$\sqrt{9} = 3$ since $3^2 = 9$

$\sqrt{16} = 4$ since $4^2 = 16$

$\sqrt{25} = 5$ since $5^2 = 25$

$\sqrt{36} = 6$ since $6^2 = 36$

$\sqrt{64} = 8$ since $8^2 = 64$

$\sqrt{100} = 10$ since $10^2 = 100$

3. Make sure students understand the correlation between squares and square roots.
4. use the number chart to show them how they can find the square root of a number. Find the number on the number chart and then draw a line up to the top of the chart and to the left of the chart.

Guided Practice

Day 3/ Lesson 3: 25 Mins

1. Explain to students that perfect square is the product you get when you multiply a number by itself.
   Procedure to check whether a given natural number is a perfect squares or not.
2. Obtain the natural number.
3. Write the number as a product of prime factors.
4. Group the factors in pairs in such a way that both the factors in each pair are equal.
5. See whether some factor is left over or not. If no factor is left over in the grouping, then the given number is a perfect square. Otherwise, it is not a perfect-square.
6. To obtain the number whose square is the given number taken over one factor from each group and multiply them.

Examples on perfect-square

Is 225 a perfect-square? If so, find the number whose square is 225.

Solution :

Resolving 225 into prime factors, we obtain

$$225 = 3 \times 3 \times 5 \times 5$$

Grouping the factors in pairs in such a way that both the factors in each pair are equal, we have

$225 = (3 \times 3) \times (5 \times 5) = 3^2 \times 5^2$

Clearly, 225 can be grouped into pairs of equal factors and no factor is left over.

Hence, 225 is a perfect-square.

Again, $225 = (3 \times 5) \times (3 \times 5) = 15 \times 15 = 15^2$

So, 225 is the square of 15.

Guided Practice

Day 4/ Lesson 4: 20 Mins

1. To find square roots of numbers that aren't perfect squares without a calculator
2. Estimate - first, get as close as you can by finding two perfect square roots your number is between.
3. Divide - divide your number by one of those square roots.
4. Average - take the average of the result of step 2 and the root.
5. Use the result of step 3 to repeat steps 2 and 3 until you have a number that is accurate enough for you.

Example: Calculate the square root of 10 ($\sqrt{10}$) to 2 decimal places.

1. Find the two perfect square numbers it lies between.

Solution:

$3^2 = 9$ and $4^2 = 16$, so $\sqrt{10}$ lies between 3 and 4.

2. Divide 10 by 3. Therefore, $10/3 = 3.33$ (you can round off your answer)

3. Average 3.33 and 3. $(3.33 + 3)/2 = 3.17$

Repeat step 2: $10/3.17 = 3.16$

Repeat step 3: Average 3.16 and 3.17. $(3.16 + 3.17)/2 = 3.162$

Try the answer --> Is 3.162 squared equal to 10? $3.1623 \times 3.1623 = 10.0001$

This is accurate enough for you, you can stop!

Assessment Activity

Assessment Activity

1. Write down these questions on the board and go round to ensure students properly answer them.
2. The teacher could invite a student to the board to solve the questions.
3. Check whether the following numbers are perfect- squares or not, give reason.
   i. 250 ii) 289 iii) 1024 iv) 1156 v) 1000
4. Q.2 The following numbers are perfect-squares, find whose perfect-squares are those.
   i. 2 x 3 x 3 x 2 x 5 x 5
   ii. 7 x 7 x 2 x 11 x 2 x 11
   Iii. 2 x 3 x 3 x 2 x 7 x 7

Assessment Activity

Summary

Review and Closing

Ask students salient questions and guage understanding through their answers.

1. How do you determine if a number is a perfect square?
2. List the square numbers between 25 and 121. Show how you know each number is a perfect square.
3. Why is squaring a number the opposite operation to calculating the square root? Explain using an example.
4. $\sqrt{72}$ lies between which two whole numbers? Explain how you know. Sketch a number line to show your answer.

Review and Closing

1. Drill the pupils on square roots of numbers. Pick ten square numbers and let the pupils say the square root of the number as fast as possible.
2. They may make calculations, but encourage them to do the working out in their heads.