

# *Squares & Square Roots*

## Learning Objectives:

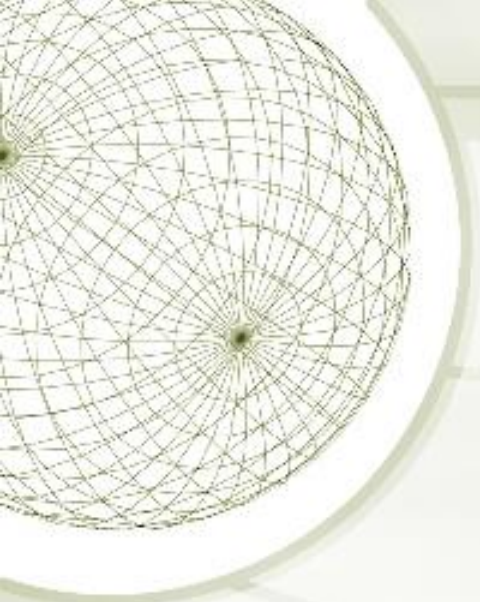
- to find square roots of perfect squares
- to estimate square roots of non-perfect squares

# *Square Numbers*

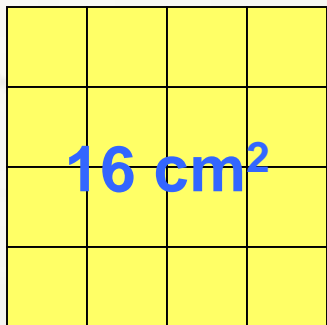
✦ One property of a perfect square is that it can be represented by a square array.

✦ Each small square in the array shown has a side length of 1cm.

✦ The large square has a side length of 4 cm.



4cm



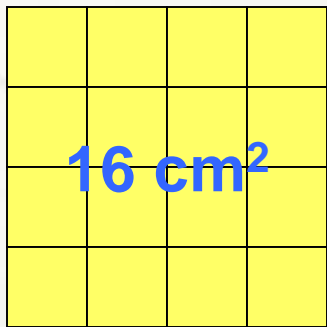
16 cm<sup>2</sup>

4cm

# *Square Numbers*

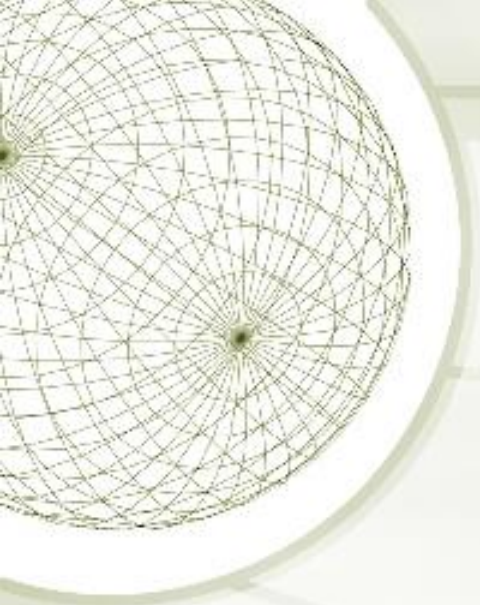
✦ The large square has an area of  $4\text{cm} \times 4\text{cm} = 16\text{ cm}^2$ .

4cm



✦ The number 4 is called the square root of 16.

✦ We write:  $4 = \sqrt{16}$



4cm



# *Square Root*

✦ A number which, when multiplied by itself, results in another number.

✦ Ex: 5 is the square root of 25.

$$5 = \sqrt{25}$$



# ***Finding Square Roots***

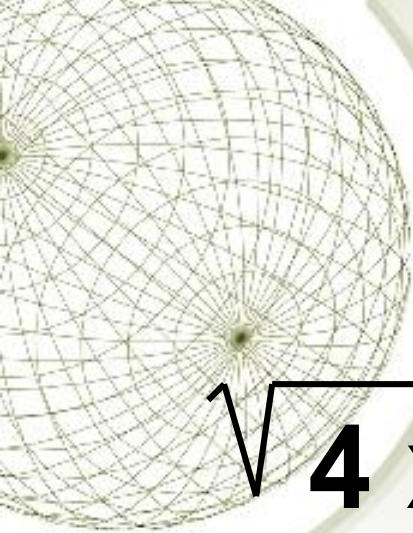
✦ We can use the following strategy to find a square root of a large number.

$$\sqrt{4 \times 9} = \sqrt{4} \times \sqrt{9}$$

$$\sqrt{36} = 2 \times 3$$

$$6 = 6$$






# ***Finding Square Roots***

$$\sqrt{4 \times 9} = \sqrt{4} \sqrt{9}$$

$$\sqrt{36} = 2 \times 3$$

$$6 = 6$$

- ★ We can factor large perfect squares into smaller perfect squares to simplify.



# ***Finding Square Roots***

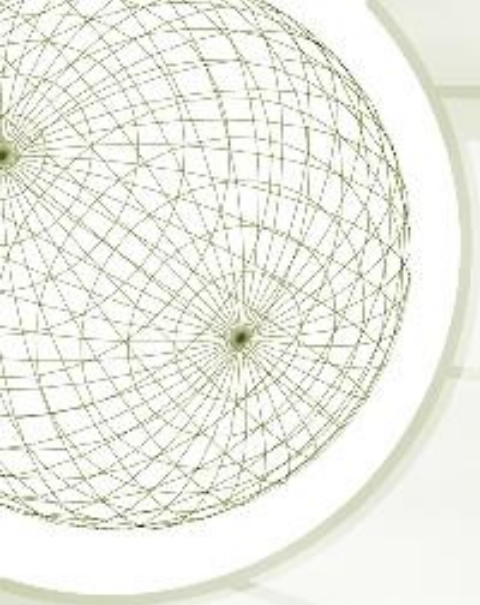
★ *Activity: Find the square root of 256*

$$\sqrt{256}$$

$$= \sqrt{4} \times \sqrt{64}$$

$$= 2 \times 8$$

$$= 16$$



# *Squares & Square Roots*

## **Estimating Square Root**



# *Estimating Square Roots*

$$\sqrt{25} = ?$$

# *Estimating Square Roots*

$$\sqrt{25} = 5$$

# *Estimating Square Roots*

$$\sqrt{49} = ?$$

# *Estimating Square Roots*

$$\sqrt{49} = 7$$

# *Estimating Square Roots*

$$\sqrt{27} = ?$$



# *Estimating Square Roots*

$$\sqrt{27} = ?$$

Since 27 is not a perfect square, we have to use another method to calculate it's square root.





# *Estimating Square Roots*

- ✦ Not all numbers are perfect squares.
- ✦ Not every number has an Integer for a square root.
- ✦ We have to estimate square roots for numbers between perfect squares.



# Non-Perfect Squares

A Non-Perfect Square: is a number whose square root is NOT a whole number.

Example:

40 is NOT a perfect square  
because  $\sqrt{40} = 6.3245\dots$



# Approximating Square Roots

You need to estimate its value of non-perfect squares by determining which two perfect squares it falls in between.

Example:

11 is a non-perfect square

11 falls between perfect squares 9 & 16

Therefore,  $\sqrt{11}$  is between  $\sqrt{9}$  and  $\sqrt{16}$

Since,  $\sqrt{9} = 3$  and  $\sqrt{16} = 4$

Then  $\sqrt{11}$  is between 3 and 4



Find the two consecutive numbers the following non-perfect square fall between. SHOW WORK!

$$\sqrt{55} \Rightarrow \sqrt{49} \text{ and } \sqrt{64} \Rightarrow \text{Between } 7 \text{ \& } 8$$

$$\sqrt{23} \Rightarrow \sqrt{16} \text{ and } \sqrt{25} \Rightarrow \text{Between } 4 \text{ \& } 5$$

$$\sqrt{5} \Rightarrow \sqrt{4} \text{ and } \sqrt{9} \Rightarrow \text{Between } 2 \text{ \& } 3$$

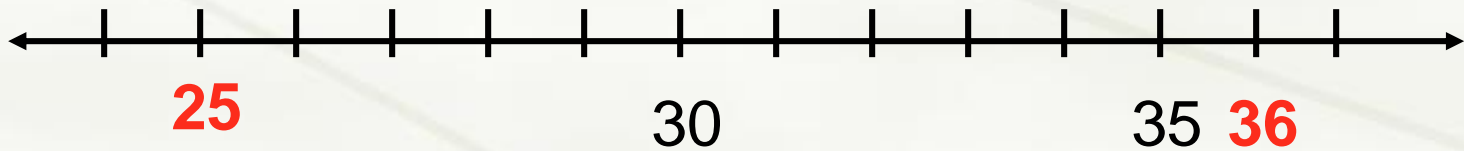
$$\sqrt{14} \Rightarrow \sqrt{9} \text{ and } \sqrt{16} \Rightarrow \text{Between } 3 \text{ \& } 4$$

$$\sqrt{44} \Rightarrow \sqrt{36} \text{ and } \sqrt{49} \Rightarrow \text{Between } 6 \text{ \& } 7$$

# *Estimating Square Roots*

✦ Example:  $\sqrt{27}$

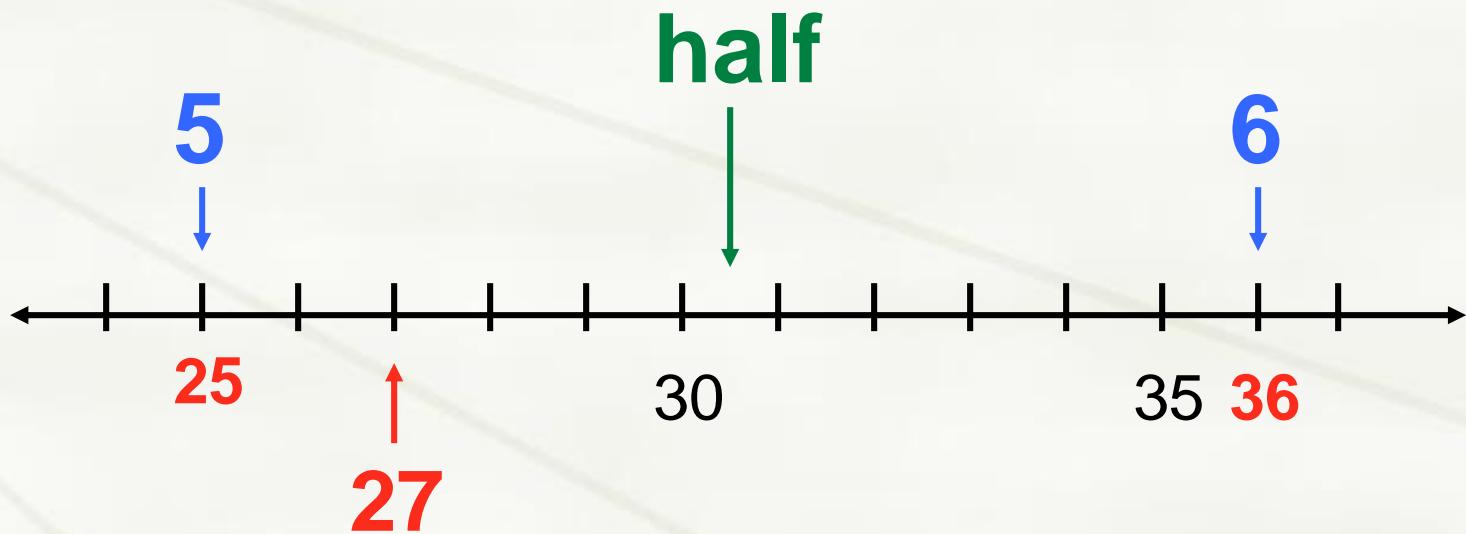
*What are the perfect squares on  
each side of 27?*





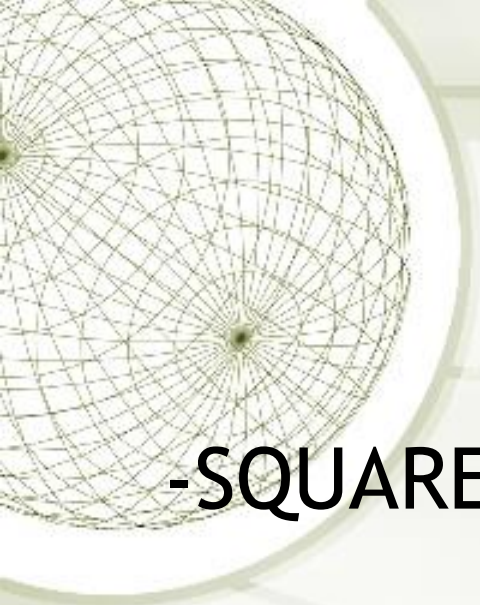
# Estimating Square Roots

✦ Example:  $\sqrt{27}$



Estimate  $\sqrt{27} = 5.2$





# ***HOMWORK***

**-SQUARE ROOT WORKSHEET**