

Name: KEY

Date: _____

Math 8**Lesson S2: Estimating Square Roots of Non-Perfect Squares****Recall:**

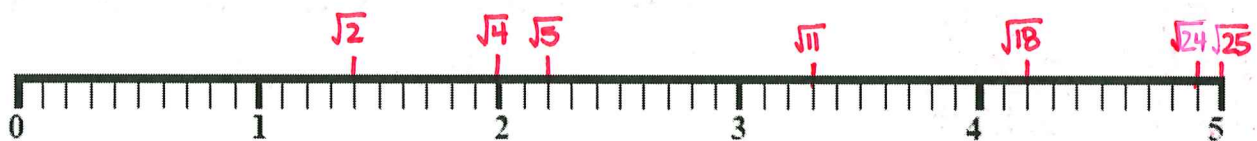
- ✓ A **perfect square** is a number created by squaring a whole number (or multiplying a whole number by itself).
- ✓ Perfect squares are related to the **area** of a square (base x height).
- ✓ A **square root** is the number that is multiplied by itself to create a perfect square.

A **non-perfect square** is a number that cannot be created by squaring a whole number.

Examples of Perfect Squares	Example of Non-Perfect Squares
1, 4, 9, 16, 25, 49, 64, 81, 100, 121, 144, 169, 196, 225, ...	(anything that's not over there) ← 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, ...

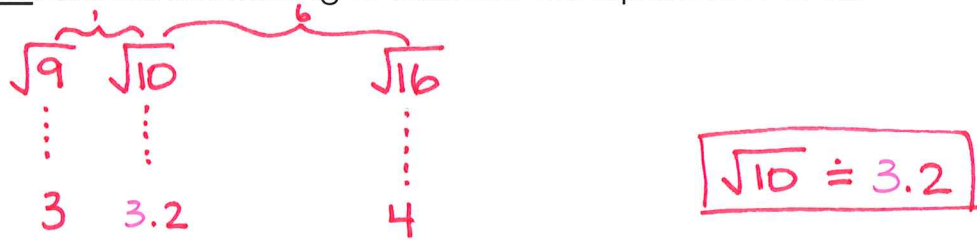
Investigate: Work with a partner. Use the number line below to place each square root on the number line to show its approximate value:

$$\sqrt{2}, \sqrt{4}, \sqrt{5}, \sqrt{11}, \sqrt{18}, \sqrt{24}, \sqrt{25}$$

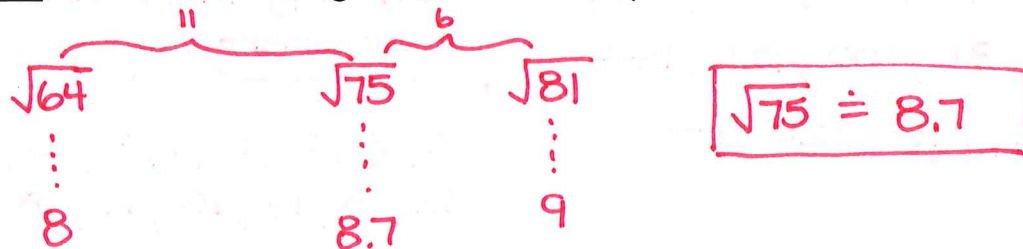


Benchmarking is a method that can be used to estimate the square root of a non-perfect square. The idea is to find the 2 consecutive perfect squares that surround the non-perfect square, and then to use the square roots of the perfect square to estimate the square root of the non-perfect square.

Example 1: Use benchmarking to estimate the square root of 10.



Example 2: Use benchmarking to estimate the square root of 75.



Checking your estimate: To check the answer to a square root, do the opposite: square it!

Example 3: Is 5.1 or 5.2 a better estimate of $\sqrt{27}$?

$\begin{array}{r} 5.1 \\ \times 5.1 \\ \hline 51 \\ 2550 \\ \hline 26.01 \end{array}$	$\begin{array}{r} 5.2 \\ \times 5.2 \\ \hline 104 \\ 2600 \\ \hline 27.04 \end{array}$
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5.2 is a better estimate of $\sqrt{27}$ since 5.2^2 is closer to 27 than 5.1^2

Name: KEY Date: _____

Square Roots Worksheet

Developing

Estimate the answers to 1 decimal.

1 a. $\sqrt{4} = 2$

1 b. $\sqrt{115} \approx 10.7$

1 c. $\sqrt{20} \approx 4.5$

2 a. $\sqrt{45} \approx 6.7$

2 b. $\sqrt{46} \approx 6.8$

2 c. $\sqrt{88} \approx 9.4$

3 a. $\sqrt{82} \approx 9.1$

3 b. $\sqrt{90} \approx 9.5$

3 c. $\sqrt{71} \approx 8.4$

4 a. $\sqrt{49} = 7$

4 b. $\sqrt{140} \approx 11.8$

4 c. $\sqrt{38} \approx 6.2$

5 a. $\sqrt{73} \approx 8.5$

5 b. $\sqrt{51} \approx 7.1$

5 c. $\sqrt{2} \approx 1.4$

6 a. $\sqrt{41} \approx 6.4$

6 b. $\sqrt{94} \approx 9.7$

6 c. $\sqrt{59} \approx 7.7$

Name: _____ Date: _____

Square Roots Worksheet

Proficient

Estimate the answers to 1 decimal.

1 a. $\sqrt{216} \approx 14.7$

1 b. $\sqrt{136} \approx 11.7$

1 c. $\sqrt{198} \approx 14.1$

2 a. $\sqrt{131} \approx 11.4$

2 b. $\sqrt{186} \approx 13.6$

2 c. $\sqrt{113} \approx 10.6$

3 a. $\sqrt{143} \approx 11.9$

3 b. $\sqrt{109} \approx 10.4$

3 c. $\sqrt{192} \approx 13.9$

4 a. $\sqrt{148} \approx 12.2$

4 b. $\sqrt{200} \approx 14.1$

4 c. $\sqrt{111} \approx 10.5$

5 a. $\sqrt{185} \approx 13.6$

5 b. $\sqrt{132} \approx 11.5$

5 c. $\sqrt{207} \approx 14.4$

6 a. $\sqrt{123} \approx 11.1$

6 b. $\sqrt{127} \approx 11.3$

6 c. $\sqrt{156} \approx 12.5$

Name: _____ Date: _____

Square Roots Worksheet

Extending

Estimate the answers to 2 decimals.

1 a. $\sqrt{23} \approx 4.80$

1 b. $\sqrt{315} \approx 17.75$

2 a. $\sqrt{327} \approx 18.08$

2 b. $\sqrt{293} \approx 17.12$

3 a. $\sqrt{299} \approx 17.29$

3 b. $\sqrt{253} \approx 15.91$

4 a. $\sqrt{368} \approx 19.18$

4 b. $\sqrt{70} \approx 8.37$