Simplifying Square Roots

Perfect Squares are numbers whose square roots are integers.

List the first 15 perfect squares:

The square roots of numbers that are non-perfect squares can be simplified.

A square root is considered simplified when there is no perfect square that will evenly divide into the radicand (the part underneath the square root symbol).

Determine whether the following square roots are simplified.

(Think: Can any of the perfect squares I listed above evenly divide into the number underneath the square root symbol? If you find one that can be divided into it, then the square root is not simplified)

1. $\sqrt{25}$ **2.** $\sqrt{10}$ **3.** $\sqrt{200}$ **4.** $\sqrt{99}$

Here are the steps to simplify a square root that is not in simplest form:

A. Determine a perfect square that will evenly divide into the radicand (part underneath the square root symbol).
B. Write the radicand as the product of the perfect square and another factor.
C. Take the square root of the perfect square and place it on the outside of the radical. Leave the remaining factor underneath the square root symbol.
D. Repeat steps A – C until no remaining perfect square will evenly divide into the radicand.

Examples:

$\sqrt{50}$ $\sqrt{48}$ $\sqrt{72}$

Simplify each of the following square roots. Show your work!

1. $\sqrt{18}$	**2.** $\sqrt{27}$
3. $\sqrt{8}$	**4.** $\sqrt{5}$
5. $\sqrt{28}$	**6.** $\sqrt{75}$
7. $\sqrt{45}$	**8.** $\sqrt{32}$
9. $\sqrt{36}$	**10.** $\sqrt{128}$

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1. Not simplified (5 is simplified answer)
2. Simplified
3. Not simplified (100 will go into 200 – final answer would be $10\sqrt{2}$)
4. Not simplified (9 will go into 99 – final answer would be $3\sqrt{11}$)

Examples:

$\sqrt{50} = \sqrt{25 \bullet 2}$
$= 5\sqrt{2}$

$\sqrt{48} = \sqrt{4 \bullet 12}$
$= 2\sqrt{12}$
$= 2\sqrt{4 \bullet 3}$
$= 2 \bullet 2\sqrt{3}$
$= 4\sqrt{3}$

or

$\sqrt{48} = \sqrt{16 \bullet 3}$
$= 4\sqrt{3}$

$\sqrt{72} = \sqrt{9 \bullet 8}$
$= 3\sqrt{8}$
$= 3\sqrt{4 \bullet 2}$
$= 3 \bullet 2\sqrt{2}$
$= 6\sqrt{2}$

or

$\sqrt{72} = \sqrt{36 \bullet 2}$
$= 6\sqrt{2}$

Make sure to mention to students how to check their work.

- By squaring the outside number and then multiplying it by the inside number, they should get the original radicand if they did the simplification correctly.
- Alternately, students could put the original square root into their calculator to get a decimal approximation and then do the same with their simplified answer to see if they get the same decimal approximation. Since 8th grade students will have access to their calculator for the entire math portion of the EOG, it is important they realize how to use their calculator to check their answers.

Student page 2 –

1. $\sqrt{18} = 3\sqrt{2}$
2. $\sqrt{27} = 3\sqrt{3}$
3. $\sqrt{8} = 2\sqrt{2}$
4. $\sqrt{5}$ = simplified
5. $\sqrt{28} = 2\sqrt{7}$
6. $\sqrt{75} = 5\sqrt{3}$
7. $\sqrt{45} = 3\sqrt{5}$
8. $\sqrt{32} = 4\sqrt{2}$
9. $\sqrt{36} = 6$
10. $\sqrt{128} = 8\sqrt{2}$