

Do Now:

Compute each of the following squares and square roots:

$$\begin{array}{cccccccccccccc}
 1^2 & 2^2 & 3^2 & 4^2 & 5^2 & 6^2 & 7^2 & 8^2 & 9^2 & 10^2 & 11^2 & 12^2 & 13^2 \\
 1 & 4 & 9 & 16 & 25 & 36 & 49 & 64 & 81 & 100 & 121 & 144 & 169
 \end{array}$$

$$\begin{array}{cccccccccccccc}
 \sqrt{1} & \sqrt{4} & \sqrt{9} & \sqrt{16} & \sqrt{25} & \sqrt{36} & \sqrt{49} & \sqrt{64} & \sqrt{81} & \sqrt{100} & \sqrt{121} & \sqrt{144} & \sqrt{169} \\
 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13
 \end{array}$$

Notation:Square root or radical notation: $\text{index}\sqrt{\text{radicand}}$ **Simplifying Radicals***Method 1: Prime Factorization*

- 1) If the radicand is not a perfect square number, find the prime factorization of the radicand.
 - a. Factor tree, or list out the prime numbers that multiply out to the radicand
- 2) Since the index of a square root is 2, if we have pairs of a factor, then that factor can move outside the radical
- 3) The numbers without a pair, will remain under the radical.
- 4) Multiply all factors outside the radical. Then multiply the numbers inside the radical.

Ex1) $\sqrt{252}$

Step 1) Prime factorization: $\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 7}$ Step 2) Since this is the square root, we want to pair up factors: $\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 7}$ Step 3) Move the paired factors outside the radical: $2 \cdot 3 \sqrt{7}$ Step 4) Simplify both inside and outside the radical by multiplying: $6\sqrt{7}$ *Method 2: Perfect Square Numbers as Factors of the Radicand*

- 1) Find the largest perfect square number that will evenly divide into the radicand. Take that number and take the square root of it and place it outside the radical
- 2) Repeat again until the radicand can no longer be divided by a perfect square.

Ex2) $\sqrt{108}$

What perfect square number can divide evenly into 108? $\frac{36}{36} \cdot \frac{9}{9}$

$$\sqrt{36 \cdot 3} = 6\sqrt{3} \quad \text{or} \quad \sqrt{9 \cdot 12} = 3\sqrt{12} = 3\sqrt{4 \cdot 3} = 3 \cdot 2\sqrt{3} = 6\sqrt{3}$$
Examples

Ex3) $\sqrt{128}$
 $\sqrt{64 \cdot 2}$
 $8\sqrt{2}$

Ex4) $\sqrt{27}$
 $\sqrt{3 \cdot 3 \cdot 3}$
 $3\sqrt{3}$

Ex5) $3\sqrt{125}$
 $3\sqrt{5 \cdot 5 \cdot 5}$
 $5 \cdot 3\sqrt{5}$
 $15\sqrt{5}$

Ex6) $\sqrt{33}$
 $\sqrt{3 \cdot 11}$
 simplified

Extra Practice

Simplify using whichever method you prefer. Show all work for credit.

1) $\sqrt{512}$

$2 \cdot 2 \cdot 2 \cdot 2 \sqrt{2}$
 $16\sqrt{2}$

512
^
2 256
^
2 128
^
2 64
^
2 32
^
2 16
^
2 8
^
2 4
^
2 2

2) $2\sqrt{98}$

$2\sqrt{2 \cdot 49}$
 $7 \cdot 2\sqrt{2}$
 $14\sqrt{2}$

3) $\sqrt{224}$

$\sqrt{16 \cdot 14}$
 $4\sqrt{14}$

4) $3\sqrt{162}$

$3\sqrt{2 \cdot 81}$
 $9 \cdot 3\sqrt{2}$
 $27\sqrt{2}$

5) $7\sqrt{16}$

$7 \cdot 4$
 28

6) $4\sqrt{71}$

2 14
^
2 7
^
2 3.5
^
2 1.75
^
2 0.875
^
2 0.4375
^
2 0.21875
^
2 0.109375
^
2 0.0546875
^
2 0.02734375
^
2 0.013671875
^
2 0.0068359375
^
2 0.00341796875
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2 0.001708984375
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2 0.0008544921875
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2 0.00042724609375
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2 0.000213623046875
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2 0.0001068115234375
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