Name ____ Date ________________

Simplifying Square Roots

Simplify the square roots as much as possible.

1. $\sqrt{24}$

2. $\sqrt{338}$

3. $\sqrt{196}$

4. $\sqrt{2{,}420}$

Simplify each of the square roots in Problems 1–5 as much as possible.

1. $\sqrt{98}$

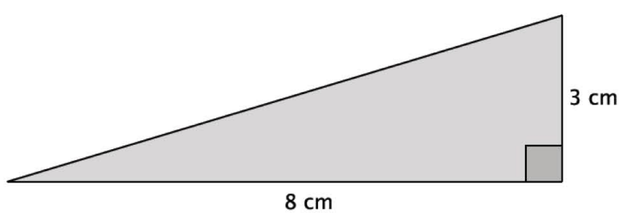
2. $\sqrt{54}$

3. $\sqrt{144}$

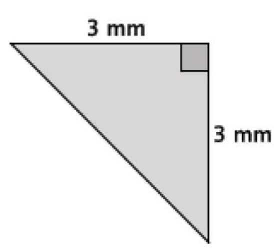
4. $\sqrt{512}$

5. $\sqrt{756}$

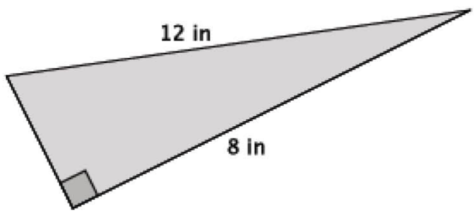
6. What is the length of the unknown side of the right triangle? Simplify your answer.



7. What is the length of the unknown side of the right triangle? Simplify your answer.



8. What is the length of the unknown side of the right triangle? Simplify your answer.



9. Josue simplified $\sqrt{450}$ as $15\sqrt{2}$. Is he correct? Explain why or why not.

10. Tiah was absent from school the day that you learned how to simplify a square root. Using $\sqrt{360}$, write Tiah an explanation for simplifying square roots.

Simplify the square roots as much as possible.

1. $\sqrt{24}$

$$\begin{aligned}\sqrt{24} &= \sqrt{2^2 \times 6}\\ &= \sqrt{2^2} \times \sqrt{6}\\ &= 2\sqrt{6}\end{aligned}$$

2. $\sqrt{338}$

$$\begin{aligned}\sqrt{338} &= \sqrt{13^2 \times 2}\\ &= \sqrt{13^2} \times \sqrt{2}\\ &= 13\sqrt{2}\end{aligned}$$

3. $\sqrt{196}$

$$\begin{aligned}\sqrt{196} &= \sqrt{14^2}\\ &= 14\end{aligned}$$

4. $\sqrt{2,420}$

$$\begin{aligned}\sqrt{2,420} &= \sqrt{2^2 \times 11^2 \times 5}\\ &= \sqrt{2^2} \times \sqrt{11^2} \times \sqrt{5}\\ &= 2 \times 11 \times \sqrt{2}\\ &= 22\sqrt{5}\end{aligned}$$

Simplify each of the square roots in Problems 1–5 as much as possible.

1. $\sqrt{98}$

$$\begin{aligned}\sqrt{98} &= \sqrt{2 \times 7^2}\\ &= \sqrt{2} \times \sqrt{7^2}\\ &= 7\sqrt{2}\end{aligned}$$

2. $\sqrt{54}$

$$\begin{aligned}\sqrt{54} &= \sqrt{2 \times 3^3}\\ &= \sqrt{2} \times \sqrt{3^2} \times \sqrt{3}\end{aligned}$$

3. $\sqrt{144}$

$$\begin{aligned}\sqrt{144} &= \sqrt{12^2}\\ &= 12\end{aligned}$$

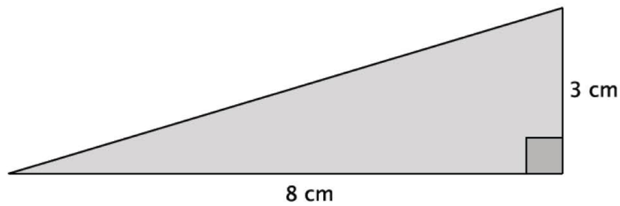
4. $\sqrt{512}$

$$\begin{aligned}\sqrt{512} &= \sqrt{2^9}\\ &= \sqrt{2^2} \times \sqrt{2^2} \times \sqrt{2^2} \times \sqrt{2^2} \times \sqrt{2}\\ &= 2 \times 2 \times 2 \times 2\sqrt{2}\\ &= 16\sqrt{2}\end{aligned}$$

5. $\sqrt{756}$

$$\begin{aligned}\sqrt{756} &= \sqrt{2^2 \times 3^3 \times 7}\\ &= \sqrt{2^2} \times \sqrt{3^2} \times \sqrt{3} \times \sqrt{7}\\ &= 2 \times 3 \times \sqrt{21}\\ &= 6\sqrt{21}\end{aligned}$$

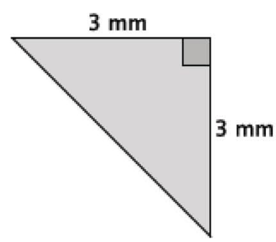
6. **What is the length of the unknown side of the right triangle? Simplify your answer.**



Let c represent the length of the hypotenuse.

$$3^2 + 8^2 = c^2$$
$$9 + 64 = c^2$$
$$75 = c^2$$
$$\sqrt{75} = \sqrt{c^2}$$
$$\sqrt{75} = c$$
$$\sqrt{5^2 \times 3} = c$$
$$\sqrt{5^2} \times \sqrt{3} = c$$
$$5\sqrt{3} = c$$

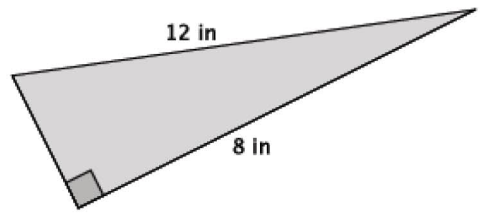
7. **What is the length of the unknown side of the right triangle? Simplify your answer.**



Let c represent the length of the hypotenuse.

$$3^2 + 3^2 = c^2$$
$$9 + 9 = c^2$$
$$18 = c^2$$
$$\sqrt{18} = \sqrt{c^2}$$
$$\sqrt{18} = c$$
$$\sqrt{3^2} \times \sqrt{2} = c$$
$$3\sqrt{2} = c$$

8. **What is the length of the unknown side of the right triangle? Simplify your answer.**



Let x represent the unknown length.

$$\begin{aligned} x^2 + 8^2 &= 12^2 \\ x^2 + 64 &= 144 \\ x^2 + 64 - 64 &= 144 - 64 \\ x^2 &= 80 \\ \sqrt{x^2} &= \sqrt{80} \\ x &= \sqrt{80} \\ x &= \sqrt{2^4 \times 5} \\ x &= \sqrt{2^2} \times \sqrt{2^2} \times \sqrt{5} \\ x &= 2 \times 2\sqrt{5} \\ x &= 4\sqrt{5} \end{aligned}$$

9. **Josue simplified $\sqrt{450}$ as $15\sqrt{2}$. Is he correct? Explain why or why not.**

$$\begin{aligned} \sqrt{450} &= \sqrt{2 \times 3^2 \times 5^2} \\ &= \sqrt{2} \times \sqrt{3^2} \times \sqrt{5^2} \\ &= 3 \times 5 \times \sqrt{2} \\ &= 15\sqrt{2} \end{aligned}$$

Yes, Josue is correct, because the number $450 = 2 \times 3^2 \times 5^2$. The factors that are perfect squares simplify to 15 leaving just the factor of 2 that cannot be simplified. Therefore, $\sqrt{450} = 15\sqrt{2}$.

10. **Tiah was absent from school the day that you learned how to simplify a square root. Using $\sqrt{360}$, write Tiah an explanation for simplifying square roots.**

To simplify $\sqrt{360}$, first write the factors of 360. The number $360 = 2^3 \times 3^2 \times 5$. Now we can use the factors to write $\sqrt{360} = \sqrt{2^3 \times 3^2 \times 5}$, which can then be expressed as $\sqrt{360} = \sqrt{2^3} \times \sqrt{3^2} \times \sqrt{5}$. Because we want to simplify square roots, we can rewrite the factor $\sqrt{2^3}$ as $\sqrt{2^2} \times \sqrt{2}$ because of the Laws of Exponents. Now we have:

$$\sqrt{360} = \sqrt{2^2} \times \sqrt{2} \times \sqrt{3^2} \times \sqrt{5}$$

Each perfect square can be simplified:

$$\begin{aligned} \sqrt{360} &= 2 \times \sqrt{2} \times 3 \times \sqrt{5} \\ &= 2 \times 3 \times \sqrt{2} \times \sqrt{5} \\ &= 6\sqrt{10} \end{aligned}$$

The simplified version of $\sqrt{360} = 6\sqrt{10}$.