Simplifying Radicals

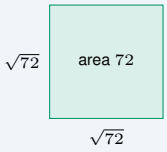
Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

A square root $\sqrt{a}$ asks "what nonnegative number squared gives a?" To simplify, pull out the largest *perfect square* factor: $\sqrt{a^2 b} = a\sqrt{b}$. Multiply or divide roots with $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$. Combine *like* radicals (the same number under the root) by adding or subtracting their coefficients.

▷ **Example:** Simplify $\sqrt{72}$. **Work:** Factor out the largest perfect square: $72 = 36 \cdot 2$, and 36 is a perfect square. So $\sqrt{72} = \sqrt{36} \cdot \sqrt{2} = 6\sqrt{2}$.

★ **Answer:** $6\sqrt{2}$



$\sqrt{72} = 6\sqrt{2}$ is the side of a square of area 72.

Practice Problems

Simplify each radical expression.

1. $\sqrt{49}$ _____
2. $\sqrt{12}$ _____
3. $\sqrt{50}$ _____
4. $\sqrt{18}$ _____
5. $\sqrt{8}$ _____
6. $\sqrt{45}$ _____
7. $\sqrt{100}$ _____
8. $\sqrt{32}$ _____
9. $\sqrt{75}$ _____
10. $\sqrt{2} \cdot \sqrt{8}$ _____
11. $3\sqrt{5} + 2\sqrt{5}$ _____
12. $\sqrt{200}$ _____
13. $\sqrt{27}$ _____
14. $\dfrac{\sqrt{50}}{\sqrt{2}}$ _____

Word Problems

15. A square room has an area of 144 square feet. What is the length of one side? _____
16. A square garden has an area of 50 square meters. Write its side length in simplest radical form. _____
17. A square tile has an area of 32 square inches. Write its side length in simplest radical form. _____
18. A square has an area of 18 square centimeters. Write its side length in simplest radical form. _____

Answer Keys

1. $\boxed{7}$	**7.** $\boxed{10}$	**13.** $\boxed{3\sqrt{3}}$
2. $\boxed{2\sqrt{3}}$	**8.** $\boxed{4\sqrt{2}}$	**14.** $\boxed{5}$
3. $\boxed{5\sqrt{2}}$	**9.** $\boxed{5\sqrt{3}}$	**15.** $\boxed{12 \text{ ft}}$
4. $\boxed{3\sqrt{2}}$	**10.** $\boxed{4}$	**16.** $\boxed{5\sqrt{2} \text{ m}}$
5. $\boxed{2\sqrt{2}}$	**11.** $\boxed{5\sqrt{5}}$	**17.** $\boxed{4\sqrt{2} \text{ in}}$
6. $\boxed{3\sqrt{5}}$	**12.** $\boxed{10\sqrt{2}}$	**18.** $\boxed{3\sqrt{2} \text{ cm}}$

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Ask yourself "what number squared gives 49?" Since $7 \times 7 = 49$, the root is 7. So the final answer is 7.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Pull out the perfect-square factor: $12 = 4 \cdot 3$, so $\sqrt{12} = \sqrt{4}\,\sqrt{3} = 2\sqrt{3}$. So the final answer is $2\sqrt{3}$.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $50 = 25 \cdot 2$, and 25 is a perfect square, so $\sqrt{50} = 5\sqrt{2}$. So the final answer is $5\sqrt{2}$.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $18 = 9 \cdot 2$, so $\sqrt{18} = 3\sqrt{2}$. So the final answer is $3\sqrt{2}$.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $8 = 4 \cdot 2$, giving $\sqrt{8} = 2\sqrt{2}$. So the final answer is $2\sqrt{2}$.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $45 = 9 \cdot 5$, so $\sqrt{45} = 3\sqrt{5}$. So the final answer is $3\sqrt{5}$.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $100 = 10^2$ is a perfect square, so the root is exactly 10 with no radical left. So the final answer is 10.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The largest perfect-square factor of 32 is 16: $\sqrt{32} = \sqrt{16}\,\sqrt{2} = 4\sqrt{2}$. So the final answer is $4\sqrt{2}$.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $75 = 25 \cdot 3$, so $\sqrt{75} = 5\sqrt{3}$. So the final answer is $5\sqrt{3}$.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply under one root first: $\sqrt{2} \cdot \sqrt{8} = \sqrt{16} = 4$. So the final answer is 4.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is These are like radicals (both $\sqrt{5}$), so add the coefficients: $3 + 2 = 5$, giving $5\sqrt{5}$. So the final answer is $5\sqrt{5}$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $200 = 100 \cdot 2$, so $\sqrt{200} = 10\sqrt{2}$. So the final answer is $10\sqrt{2}$.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $27 = 9 \cdot 3$, so $\sqrt{27} = 3\sqrt{3}$. So the final answer is $3\sqrt{3}$.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Combine under a single root: $\sqrt{\frac{50}{2}} = \sqrt{25} = 5$. So the final answer is 5.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The side of a square is the square root of its area: $\sqrt{144} = 12$ feet. So the final answer is 12 ft.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Side $= \sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$ meters. So the final answer is $5\sqrt{2}$ m.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Side $= \sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2}$ inches. So the final answer is $4\sqrt{2}$ in.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Side $= \sqrt{18} = \sqrt{9 \cdot 2} = 3\sqrt{2}$ centimeters. So the final answer is $3\sqrt{2}$ cm.

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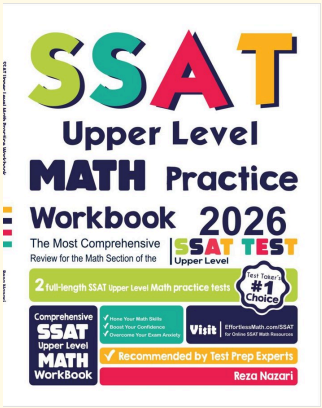

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