A1 S2 87d1 9-5 Simplify Radicals & Perfect Squares

Alg 1 Week 8 Monday Warm Up

1. Skill 13: Multiplying Polynomials: Use a rectangle to multiply and simplify.

   $(2x + 1)(4x^2 - 2x + 1)$

2. Skill 14: Factor a trinomial. Factor completely.

   $6x^2 + 7x - 20$

3. Skill 15: Factor Special Polynomials. Factor completely.

   $2x^3 - 24x^2 + 72x$

4. Skill 16: Solve a Quadratic Equation by Factoring

   a. $x^2 + 8x = 20$ b. $3x^2 + 7x = -4$

5. Put in order from widest to most narrow

$$f(x) = -2x^2 + 1, \quad f(x) = \frac{2}{3}x^2 - 5 \quad f(x) = 6x^2$$

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Alg 1 Week 8 Monday

Simplifying Radicals!

In the next few activities, you will be solving quadratic equations by a couple of new methods that often produce solutions involving square roots. In this activity, you will learn a method for putting radicals into their simplest form, called **simplifying radicals**.

List the first 10 perfect squares: ___ , ___ , ___ , ___ , ___ , ___ , ___ , ___ , ___ , ___

Let's review a little of what we know about radicals, or square roots. Find each root below:

1. $\sqrt{4}$ =
2. $\sqrt{25}$ =
3. $\sqrt{100}$ =
4. $\sqrt{16}$ =
5. $\sqrt{9}$ =
6. $\sqrt{144}$ =
7. $\sqrt{36}$ =
8. $\sqrt{49}$ =
9. $\sqrt{1764}$ =

Use your answers to the questions above to answer each question below:

10. Does $\sqrt{4}\cdot\sqrt{25} = \sqrt{4\cdot 25}$? Explain how you know.

11. Does $\sqrt{16}\cdot\sqrt{9} = \sqrt{16\cdot 9}$? Explain how you know.

12. Does $\sqrt{36}\cdot\sqrt{49} = \sqrt{36\cdot 49}$? Explain how you know.

These questions call attention to an important principle about how square roots work.

Product of Roots Rule

The product of two roots is equal to the root of the product.

$$\sqrt{a}\cdot\sqrt{b} = \sqrt{a\cdot b}$$

Use the principle above to find the answer to these questions involving roots:

13. $\sqrt{4}\cdot\sqrt{3} = \sqrt{}$
14. $\sqrt{9}\cdot\sqrt{2} = \sqrt{}$
15. $\sqrt{25}\cdot\sqrt{3} = \sqrt{}$
16. $\sqrt{36}\cdot\sqrt{7} = \sqrt{}$
17. $\sqrt{49}\cdot\sqrt{6} = \sqrt{}$
18. $\sqrt{144}\cdot\sqrt{5} = \sqrt{}$

This principle is most useful when we apply it in reverse. Instead of multiplying smaller roots to get one that is even larger and more difficult, we should try taking a large root and break it down into a product of smaller roots that we can do separately.

$\sqrt{12} = \sqrt{4\cdot 3} = \sqrt{4}\cdot\sqrt{3} = 2\cdot\sqrt{3}$

So $\sqrt{12} = 2\sqrt{3}$

$\sqrt{18} = \sqrt{9\cdot 2} = \sqrt{9}\cdot\sqrt{2} = 3\cdot\sqrt{2}$

So $\sqrt{18} = 3\sqrt{2}$

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We say that these answers are in **simplest radical form**. In other words, even though the numbers we started with were not perfect squares, we were able to find a perfect square that divided into them, and we did the square root of that number.
The following box summarizes how this method for simplifying radicals works:

Simplifying Radicals by Perfect Squares

Step 1: Find the largest perfect square that divides into the number under the radical.
Step 2: Write the number under the radical as a product of this perfect square and another number.
Step 3: Write this radical of a product as the product of the two radicals.
Step 4: Do the square root of the perfect square and multiply this number by the remaining radical.

Example: Simplify $\sqrt{75}$

Step 1: 25 is the largest perfect square that divides into 75. (It goes in 3 times.)
Step 2: $\sqrt{75} = \sqrt{25 \cdot 3}$
Step 3: $\sqrt{25 \cdot 3} = \sqrt{25} \cdot \sqrt{3}$
Step 4: $\sqrt{25} \cdot \sqrt{3} = 5\sqrt{3}$ Therefore, $\sqrt{75} = 5\sqrt{3}$

Use the process described above to simplify each radical below:

19. $\sqrt{50}$
20. $\sqrt{98}$
21. $\sqrt{8}$
22. $\sqrt{32}$
23. $\sqrt{72}$
24. $\sqrt{45}$
25. $\sqrt{200}$
26. $\sqrt{192}$
27. $\sqrt{162}$
28. $\sqrt{288}$
29. $\sqrt{847}$
30. $\sqrt{845}$