

Write your  
questions here!

## 3.1 B Rectangles &amp; Squares

## Notes

## PART 4: Advanced Area and Perimeter (Radicals and Factoring)

Let's do some quick review:

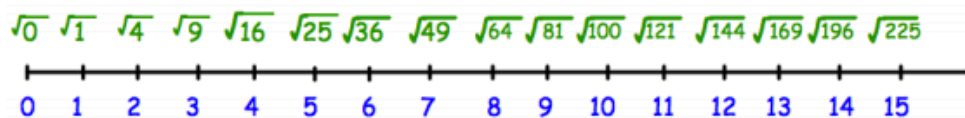
*Radicals?**Square Roots?*

Simplifying Square Roots:



Product Property of Radicals:

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

To simplify, we will use the \_\_\_\_\_ with our  
trusty Perfect-Squares number line:**Examples** Simplify the following radical expressions:

1.  $\sqrt{12}$

2.  $\sqrt{98}$

3.  $\sqrt{200}$

4.  $-4\sqrt{300}$

5.  $2\sqrt{18}$

6.  $10\sqrt{108}$

7.  $\sqrt{33}$

8.  $-\sqrt{1000}$

9.  $-\sqrt{26}$

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**Examples** Simplify the following expressions by adding or subtracting.

1.  $3\sqrt{7} + 2\sqrt{7}$

2.  $\sqrt{3} - \sqrt{48}$

3.  $4\sqrt{2} + \sqrt{3} - \sqrt{2}$

4.  $\sqrt{90} - \sqrt{40}$

**Examples:** Simplify the following radical expressions using the Product Property.

5.  $2\sqrt{2} \cdot -4\sqrt{6}$

6.  $4\sqrt{7}(3\sqrt{2} - 2)$

**Examples:** Simplify the following perfect squares using the Quotient Property.

7.  $\sqrt{\frac{16}{49}}$

8.  $\sqrt{\frac{121}{25}}$

It is not appropriate to leave a radical in the denominator of a fraction. Multiply by a form of 1 to get it out:

**Examples** Simplify the following expressions by rationalizing the denominator:

9.  $\frac{3}{\sqrt{11}}$

10.  $\frac{1}{\sqrt{4}}$

11.  $\sqrt{\frac{8}{5}}$

12.  $\sqrt{\frac{12}{6}}$

**Examples:** Simplify the following radical expressions.

13.  $3\sqrt{7} - 2\sqrt{28} + \sqrt{63}$

14.  $(3\sqrt{3} - 2\sqrt{2})^2$

Write your  
questions here!



**Examples:** Simplify the following radical expressions.

15.  $2\sqrt{5} + \sqrt{12} - \sqrt{27}$

16.  $(4\sqrt{5} - 3\sqrt{2})^2$

**Solve.**

Find the side length of  
the square.



$$A = 20\text{yd}^2$$
$$s = ?$$

Find the perimeter and area of the  
rectangle below.



$$P =$$

$$A =$$

PART 5: Solve by Factoring

The length of a rectangle is two feet  
less than 3 times the width. If the  
area of the rectangle is  $65\text{ ft}^2$ , find  
the perimeter.



The length of a rectangle is four centimeters more than width. The area is 96  
square centimeters. Find the dimensions of the rectangle.

A 4 m by 6 m rug covers half of the floor area of a room and leaves a uniform strip of bare floor around the edges. What are the dimensions of the room?

Now,  
summarize  
your notes  
here!



Summarize your notes:

### PRACTICE PROBLEMS

#### Reduce Radicals

1. Express each as a mixed radical in simplest form

a)  $\sqrt{12}$

b)  $\sqrt{147}$

c)  $\sqrt{252}$

2. Express each as a mixed radical in simplest form, then add like terms

a)  $2\sqrt{3} - 5\sqrt{3} + 4\sqrt{3}$

b)  $11\sqrt{5} - 4\sqrt{5} - 5\sqrt{5} - 6\sqrt{5}$

c)  $\sqrt{6} - 4\sqrt{2} + 3\sqrt{6} - \sqrt{2}$

d)  $2\sqrt{10} - \sqrt{10} - 4\sqrt{10} + \sqrt{5}$

3. Simplify

a)  $5\sqrt{27} - 4\sqrt{48} - \sqrt{75}$

b)  $6\sqrt{20} + \sqrt{180} - 2\sqrt{45}$

c)  $2\sqrt{54} - \sqrt{6}$

4. Simplify

a)  $\frac{1}{4}\sqrt{54} - \frac{1}{4}\sqrt{150}$

b)  $\frac{1}{2}\sqrt{8} + \frac{3}{5}\sqrt{50} - \frac{2}{3}\sqrt{18}$

5. Simplify

a)  $3(4\sqrt{5})$

b)  $\sqrt{5}(-2\sqrt{7})$

c)  $2\sqrt{3}(3\sqrt{2})$

6. Simplify

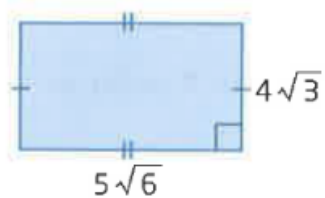
a)  $5\sqrt{6}(2\sqrt{3})$

b)  $8\sqrt{5}(\sqrt{10})$

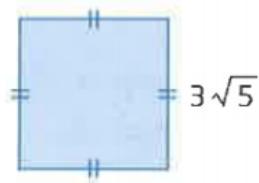
c)  $11\sqrt{2}(5\sqrt{3})$

7. Find a simplified expression for the area and perimeter of each shape

a)



b)



**Operations with Radicals**

7. Simplify.  
 $2\sqrt{3} \cdot 5\sqrt{8}$

8. Simplify.  
 $-4\sqrt{5} \cdot 3\sqrt{15}$

9. Simplify.  
 $4\sqrt{10} \cdot -3\sqrt{15}$

10. Simplify.  
 $(5\sqrt{7})^2$

11. Simplify.  
 $(3\sqrt{5})^2$

12. Simplify.  
 $5\sqrt{5}(2 - 5\sqrt{6})$

13. Simplify.  
 $\sqrt{2}(\sqrt{2} + 5)$

14. Simplify.  
 $\frac{21 - 7\sqrt{6}}{7}$

15. Simplify.  
 $\frac{12 - \sqrt{48}}{4}$

16. Simplify.  
 $\frac{4}{\sqrt{2}}$

17. Simplify.  
 $\sqrt{\frac{5}{2}}$

18. Simplify.  
 $\frac{6}{\sqrt{3}}$

19. Expand and simply where possible

a)  $(\sqrt{2} + 5)(\sqrt{2} + 5)$

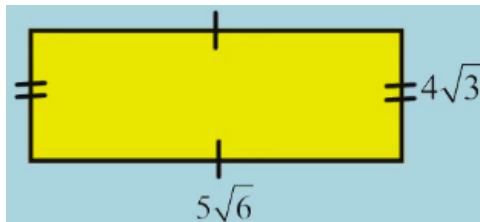
b)  $(\sqrt{3} + 2\sqrt{2})(5 + 5\sqrt{2})$

c)  $(1 + \sqrt{5})(1 - \sqrt{5})$

d)  $(4 - 3\sqrt{7})(\sqrt{7} + 1)$

**Find the area and perimeter of each rectangle below in simplified radical form.**

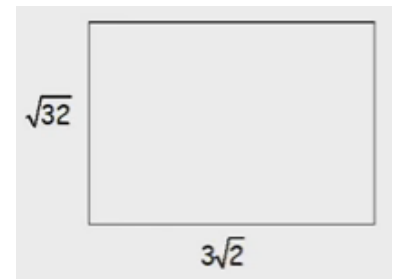
20. Find the area and perimeter.



A =

P =

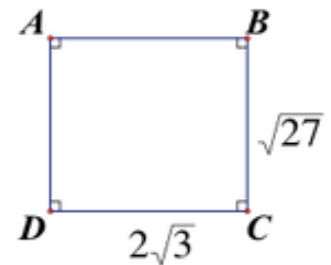
21. Find the area and perimeter.



A =

P =

22. Find the area and perimeter.



A =

P =

**Solve by taking square root**

23. A square has an area of  $80 \text{ ft}^2$ . Find the length of a side in simplified radical form.

24. A square has an area of  $675 \text{ cm}^2$ . Find the length of a side in simplified radical form.

**Quick Review: Solve the quadratic equations using the given method.**

1. Solve by factoring:

$$x^2 - 3x = -2$$

2. Solve by double factoring:

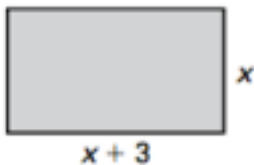
$$4x^2 - 4 = 0$$

3. Solve by double factoring::

$$2x^2 - 18x + 40 = 0$$

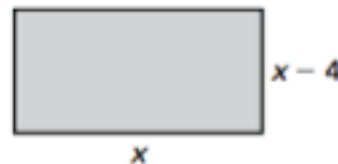
25. Find the dimensions of the rectangle below.

Area of the rectangle = 28

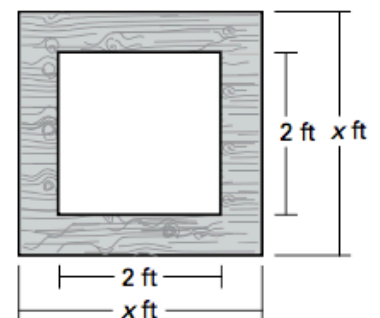


26. Find the dimensions of the rectangle below.

Area of the rectangle = 32



27. You are making a square frame of uniform width for a square picture that has side lengths of 2 ft. The total area of the frame is 5 square feet. What is the length of the sides of the frame?





<p>28. The length of a rectangle is 3 times its width. The perimeter of the rectangle is 32 feet. What are the rectangle's length and width?</p>	<p>29. The length of a rectangle is 3 more inches than its width. The area of the rectangle is 40 in<sup>2</sup>. What is the perimeter?</p>
<p>30. Kayla took 25 minutes to walk around a rectangular city block. If the block's width is <math>\frac{1}{4}</math> the size of the length, how long would it take to walk along one length?</p>	<p>31. The area of a rectangle is 32 in<sup>2</sup>, and the width of this rectangle is two times its height. What is the perimeter of the rectangle?</p>
<p>32. Robert is designing a rectangular garden. He wants the area of the garden to be 9 square meters. If the length of the lot is going to be three meters less than twice the width, what will the perimeter of the lot be in meters?</p>	<p>33. The perimeter of a rectangle is 44 inches, and its area is 120 square inches. Find the length and width of the rectangle.</p>

<p>34. The sum of the area of a square and a rectangle is <math>64 \text{ cm}^2</math>. The length of the rectangle is 4 cm more than a side of the square, and the width of the rectangle is 2 cm more than a side of the square. Find the dimensions of the rectangle and the square.</p>	<p>35. A photograph measures 20 cm by 16 cm. A strip of constant width is to be cut off the top of one side of the photo, so the area is reduced to 60% of the area of the original photo. Find the width of the cut. Include a diagram in your solution.</p>
<p>36. A rectangular performing platform in a park measures 10 feet by 12 feet. You want to triple the platform's area by adding the same distance <math>x</math> to the length and the width.</p>	<p>37. The Smiths' have decided to put a paved walkway of uniform width around their swimming pool. The pool is a rectangular pool that measures 12 feet by 20 feet. The <b>area</b> of the walkway will be 68 square feet. Find the width of the walkway.</p>

## Application and Extension

1. Simplify:  $\frac{12}{\sqrt{5}}$

2. Simplify:  $4\sqrt{3} + \sqrt{27} - \sqrt{12}$

3. Simplify:

$$\sqrt{\frac{6}{3}}$$

4. Simplify:

$$\frac{3\sqrt{3}}{5\sqrt{75}}$$

5. Simplify:

$$(-5\sqrt{5} + 4)(-2\sqrt{5} - 4)$$

6. Simplify:

$$(5 - 4\sqrt{5})(5 + 3\sqrt{5})$$