

Unit 11 – Packet 1

Notes, Class Work & Homework

- Simplifying Radicals
- Adding and Subtracting Radicals
- Multiplying and Dividing Radicals
- Pythagorean Theorem & Applications

Name _____

Class _____ Date _____

Simplifying Radicals

Procedure:

- Find, if possible, two numbers (factors) of the radicand, one of which is the largest perfect square
- Replace the radicand with these numbers
- Find the square root of the factor which is the perfect square (this value will be written as the coefficient and the non-perfect square number will remain beneath the radical sign)

Examples: Express each of the following in simplest form

1.) $\sqrt{25}$

2.) $\sqrt{16}$

3.) $\sqrt{24}$

4.) $\sqrt{48}$

Perfect Squares

$\sqrt{1} = 1$

$\sqrt{4} = 2$

$\sqrt{9} = 3$

$\sqrt{16} = 4$

$\sqrt{25} = 5$

$\sqrt{36} = 6$

$\sqrt{49} = 7$

$\sqrt{64} = 8$

$\sqrt{81} = 9$

$\sqrt{100} = 10$

$\sqrt{121} = 11$

$\sqrt{144} = 12$

5.) $5\sqrt{45}$

6.) $-\sqrt{32}$

7.) $-3\sqrt{28}$

8.) $\frac{1}{4}\sqrt{500}$

Try these:

9.) $\sqrt{81}$

10.) $\sqrt{75}$

11.) $2\sqrt{20}$

12.) $\frac{-2}{3}\sqrt{72}$

Simplifying the Square Root of a Fraction

Procedure:

- The square root of a fraction is equal to the square root of its numerator divided by the square root of its denominator

9.) $\sqrt{\frac{4}{9}}$

10.) $\sqrt{\frac{16}{49}}$

11.) $\sqrt{\frac{25}{100}}$

12.) $\sqrt{\frac{12}{9}}$

Directions: Express each of the following in simplest radical form.

29.) $\sqrt{400}$

30.) $-5\sqrt{121}$

31.) $\sqrt{.0025}$

32.) $\frac{3}{5}\sqrt{225}$

33.) $\sqrt{28}$

34.) $7\sqrt{44}$

35.) $-2\sqrt{72}$

36.) $\frac{3}{8}\sqrt{80}$

37.) $\frac{1}{2}\sqrt{300}$

38.) $4\sqrt{45}$

*39.) $-6\sqrt{24x^8}$

*40.) $\frac{2}{7}\sqrt{98m^6}$

41.) $\sqrt{\frac{16}{25}}$

42.) $3\sqrt{\frac{4}{9}}$

43.) $\frac{2}{9}\sqrt{\frac{9}{36}}$

Integrated Algebra

Name _____

Simplifying Radicals

Date _____ Class _____

1.) $\sqrt{121}$

8.) $4\sqrt{75}$

2.) $\sqrt{.49}$

3.) $-5\sqrt{16}$

9.) $\frac{2}{3}\sqrt{27}$

4.) $\sqrt{12}$

10.) $\sqrt{\frac{9}{16}}$

5.) $2\sqrt{18}$

11.) $\sqrt{.0169}$

6.) $-\sqrt{63}$

12.) $-2\sqrt{112}$

7.) $3\sqrt{40}$

13.) $\frac{3}{4}\sqrt{96}$

14.) $\frac{2}{3}\sqrt{\frac{49}{64}}$

Integrated Algebra Practice: A.N.2

www.jmap.org

NAME: _____

P.I. A.N.2: Simplify radical terms (no variable in the radicand)

Simplify:

1. $\sqrt{200}$

[A] $20\sqrt{10}$

[B] $10\sqrt{2}$

[C] $10\sqrt{20}$

[D] $2\sqrt{10}$

2. $\sqrt{75}$

[A] $5\sqrt{3}$

[B] $3\sqrt{5}$

[C] $5\sqrt{15}$

[D] $15\sqrt{5}$

3. $\sqrt{12}$

[A] $2\sqrt{6}$

[B] $2\sqrt{3}$

[C] $3\sqrt{2}$

[D] $6\sqrt{2}$

4. $\sqrt{18}$

[A] $2\sqrt{3}$

[B] $3\sqrt{6}$

[C] $3\sqrt{2}$

[D] $6\sqrt{3}$

5. $\sqrt{45}$

[A] $3\sqrt{5}$

[B] $5\sqrt{3}$

[C] $3\sqrt{15}$

[D] $15\sqrt{3}$

6. $\sqrt{500}$

[A] $50\sqrt{10}$

[B] $5\sqrt{10}$

[C] $10\sqrt{50}$

[D] $10\sqrt{5}$

7. $\sqrt{50}$

[A] $5\sqrt{2}$

[B] $2\sqrt{5}$

[C] $5\sqrt{10}$

[D] $10\sqrt{5}$

8. $\sqrt{300}$

[A] $30\sqrt{10}$

[B] $3\sqrt{10}$

[C] $10\sqrt{3}$

[D] $10\sqrt{30}$

9. $\sqrt{20}$

[A] $5\sqrt{2}$

[B] $2\sqrt{5}$

[C] $2\sqrt{10}$

[D] $10\sqrt{2}$

Addition and Subtraction of Square Root Radicals

Procedure:

- Simplify each of the radicals
- Combining *like* radicals by adding or subtracting the numerical coefficients
(Remember if not coefficient is shown, it is understood to be 1)

Examples: Add or subtract as indicated.

1.) $5\sqrt{3} + 3\sqrt{3}$

2.) $7\sqrt{5} - \sqrt{5}$

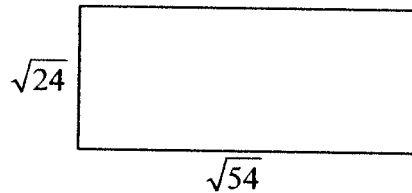
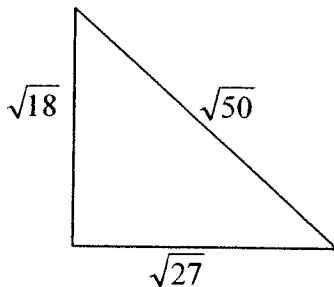
3.) $\sqrt{16} + \sqrt{100}$

4.) $5\sqrt{28} - 2\sqrt{63}$

5.) $\sqrt{48} - 3\sqrt{27}$

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

7.) For the following figures, express the perimeter in simplest radical form.



Regents Algebra: Assignment
Addition and Subtraction of Radicals

Name _____

Date _____

Directions: Perform the indicated operation and express the result in simplest radical form.

1.) $7\sqrt{5} + 3\sqrt{5}$

2.) $9\sqrt{7} - 5\sqrt{7}$

3.) $\sqrt{2} + \sqrt{8}$

4.) $2\sqrt{63} + 5\sqrt{7}$

5.) $\sqrt{75} - \sqrt{147}$

6.) $2\sqrt{18} - 6\sqrt{72}$

7.) $\sqrt{200} - \sqrt{18}$

8.) $-3\sqrt{12} + \sqrt{27}$

$$9.) 3\sqrt{3} - \sqrt{48}$$

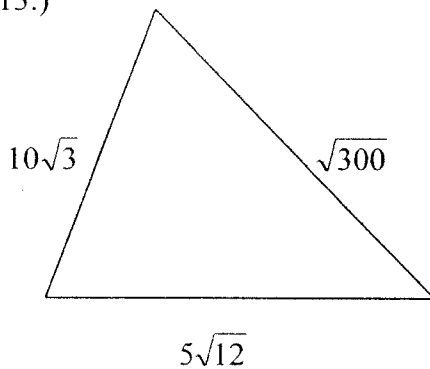
$$10.) 5\sqrt{3} + 4\sqrt{27} - \sqrt{12}$$

$$11.) 6\sqrt{8} - \sqrt{24} - 7\sqrt{32}$$

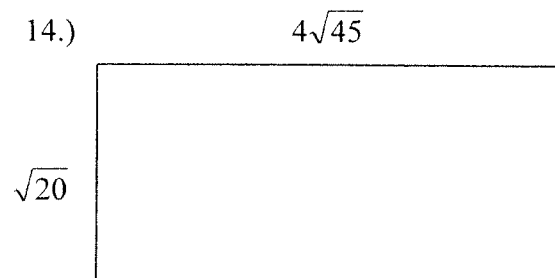
$$12.) -2\sqrt{9} - \sqrt{25}$$

Directions: Express the perimeter of each of the following in simplest radical form.

13.)



14.)



- 15.) The measures of two sides of a triangle are $3\sqrt{2}$ and $\sqrt{8}$ and the measure of the perimeter is $\sqrt{98}$. Find the measure of the third side.

Integrated Algebra Practice: A.N.3 #1

www.jmap.org

NAME: _____

P.1. A.N.3: Perform the four arithmetic operations using like and unlike radical terms and express the result in simplest form

Simplify:

1. $3\sqrt{5} + 5\sqrt{5} - 3\sqrt{5}$

- [A] $11\sqrt{5}$ [B] $5\sqrt{5}$ [C] $\sqrt{25}$ [D] 25

2. $9\sqrt{3} + 2\sqrt{3} - 2\sqrt{3}$

- [A] $\sqrt{27}$ [B] 27
 [C] $13\sqrt{3}$ [D] $9\sqrt{3}$

3. $7\sqrt{2} + 6\sqrt{2} - 5\sqrt{2}$

- [A] $8\sqrt{2}$ [B] 16
 [C] $\sqrt{16}$ [D] $18\sqrt{2}$

4. $3\sqrt{3} - 3\sqrt{49} + 4\sqrt{48}$

5. $5\sqrt{2} - \sqrt{25} + 3\sqrt{8}$

6. $7\sqrt{6} - 2\sqrt{9} + 2\sqrt{54}$

7. $-8\sqrt{7} - \sqrt{36} - 5\sqrt{63}$

8. $-9\sqrt{5} - 2\sqrt{4} + 9\sqrt{20}$

9. Simplify $\frac{4\sqrt{3} - \sqrt{3}}{6}$.

- [A] $\frac{\sqrt{3}}{2}$ [B] $\frac{2}{3}$ [C] 2
 [D] 6 [E] 0

10. Darin simplified $5\sqrt{5} + 2\sqrt{5}$ and got 15.7. Martha simplified the same expression and got 50. Use a calculator to determine who got the correct answer.

Multiplication and Division of Square Root Radicals

Procedure:

- ✓ Multiply (or divide) the numerical coefficients
- ✓ Multiply (or divide) the radicals
- ✓ If possible, simplify the result

*** Important: Remember you cannot multiply or divide radicands with non-radicals ***

Examples: Perform the indicated operation and express the result in simplest radical form.

1.) $(6\sqrt{5})(2\sqrt{15})$

2.) $(16\sqrt{125}) \div (8\sqrt{5})$

3.) $\frac{3\sqrt{54}}{6\sqrt{3}}$

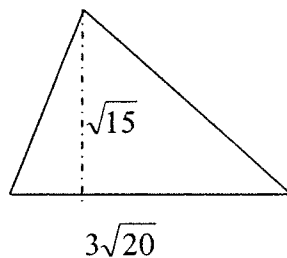
4.) $\frac{10\sqrt{72}}{-2\sqrt{8}}$

5.) $(-2\sqrt{6})(3\sqrt{12})$

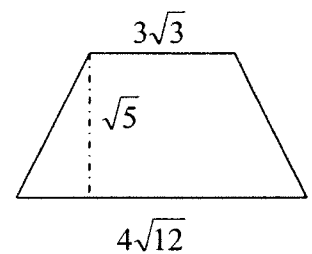
6.) $(2\sqrt{3})^2$

7.) $\frac{8\sqrt{3}}{24\sqrt{3}}$

8.) Express the area in simplest radical form



9.) Express the area in simplest radical form



Regents Algebra: Assignment
Multiplication and Division of Radicals

Name _____

Date _____

Examples: Perform the indicated operation and express the result in simplest radical form.

1.) $(\sqrt{10})(\sqrt{5})$

2.) $\sqrt{80} \cdot \sqrt{5}$

3.) $4\sqrt{3} \cdot 5\sqrt{3}$

4.) $\frac{\sqrt{40}}{\sqrt{5}}$

5.) $-9\sqrt{10} \cdot \sqrt{30}$

6.) $5\sqrt{12} \cdot 2\sqrt{3}$

7.) $\frac{\sqrt{200}}{\sqrt{8}}$

8.) $(\frac{1}{2}\sqrt{8})(\frac{1}{2}\sqrt{2})$

9.) $\frac{-8\sqrt{20}}{-2\sqrt{10}}$

10.) $(\frac{3}{4}\sqrt{24})(2\sqrt{2})$

11.) $\frac{20\sqrt{5}}{4\sqrt{5}}$

12.) $\frac{30\sqrt{56}}{15\sqrt{7}}$

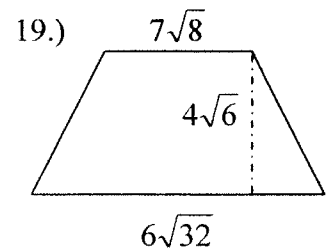
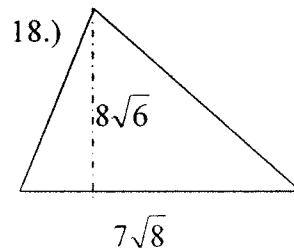
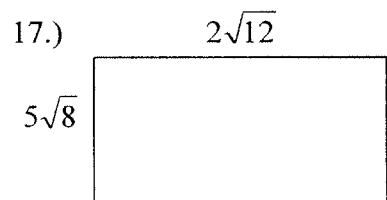
13.) $8\sqrt{6} (3\sqrt{12})$

14.) $(3\sqrt{7})^2$

15.) $\frac{18\sqrt{72}}{-3\sqrt{6}}$

16.) $(-8\sqrt{15})^2$

Directions: Find the area of each of the following. Express the answer in simplest radical form.



Regents Algebra: Class Work
Operations with Radicals Review

Name _____

Date _____

Examples: Perform the indicated operation and express the result in simplest radical form.

1.) $3\sqrt{5} + 5\sqrt{5} - \sqrt{5}$

2.) $3\sqrt{32} - 3\sqrt{50}$

3.) $3\sqrt{63} + \frac{1}{4}\sqrt{28}$

4.) $(3\sqrt{2})(-8\sqrt{6})$

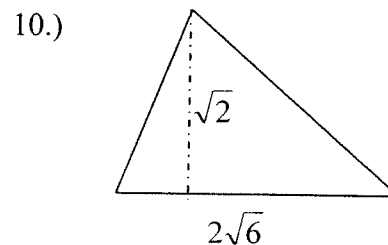
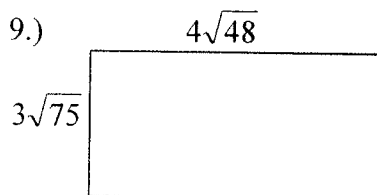
5.) $(-2\sqrt{5})^2$

6.) $\frac{15\sqrt{10}}{2\sqrt{5}}$

7.) $\frac{4\sqrt{75}}{8\sqrt{3}}$

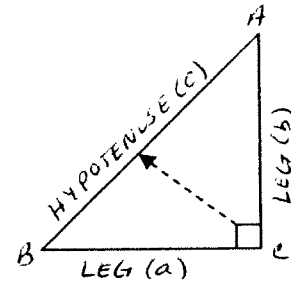
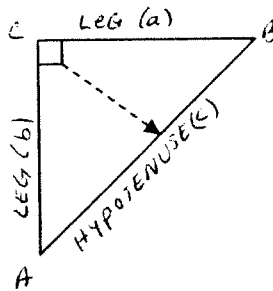
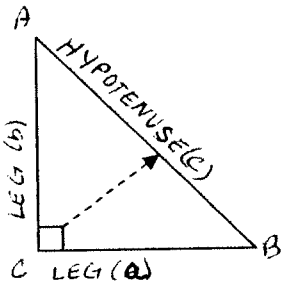
8.) $\frac{3\sqrt{54}}{6\sqrt{2}}$

Directions: (#9.) Find the perimeter and express the answer in simplest radical form.
(#10.) Find the area and express the answer in simplest radical form.



Theorem of Pythagoras

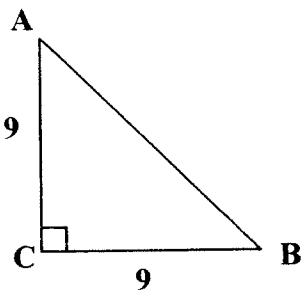
➤ Theorem: In a right triangle the sum of the squares of the lengths of the leg equals the square of the length of the hypotenuse.



➤ This theorem is useful in finding unknown lengths of a right triangle.

Directions: Solve each of the problems below. Show all of your work including formulas and substitutions. a and b are lengths of the legs and c is the length of the hypotenuse.

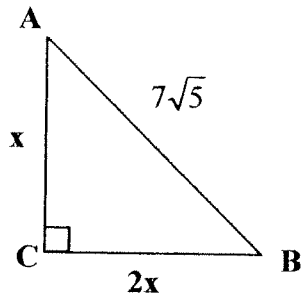
1.) Find the length of \overline{AB} in simplest radical form.



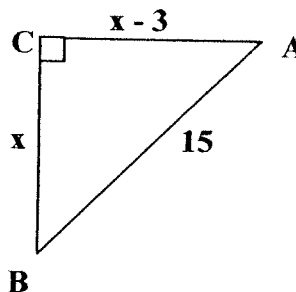
2.) Find the length of b .

$a = 15, c = 25$

3.) Find the length of \overline{AC} and \overline{BC} .



4.) Find the length of \overline{CB} and \overline{AC}

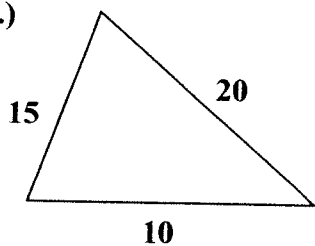


Converse of the Pythagorean Theorem: If the sum of the squares of the lengths of the legs of a triangle equals the square of the length of the longest side, then the triangle is a right triangle.

If $a^2 + b^2 = c^2$, then the triangle is a right triangle.

Directions: Determine whether the given lengths are sides of a right triangle. Explain your reasoning.

7.)



8.) 2.5, 6, 6.5

Regents Algebra: Assignment
Pythagorean Theorem

Name _____

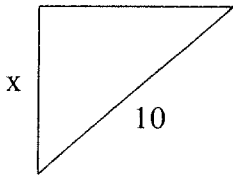
Date _____

Directions: Find the missing length of the right triangle using the information provided and where appropriate express the answer in simplest radical form. Show all of your work.

1.) If $b = 15$, $c = 17$, find a

2.) If $\angle B$ is a right angle and $AB = 12$, $BC = 35$, find the length of AC

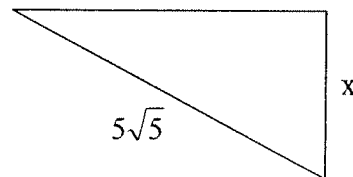
3.) $x + 2$



4.) If $b = 3$, $c = 7$ find a

5.) If $a = 14$, $c = 21$, find b

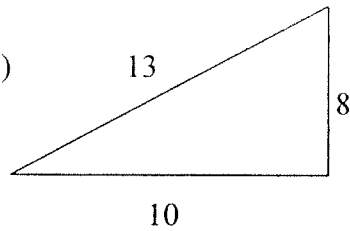
6.) $x + 5$



Directions: Determine whether the given lengths are sides of a right triangle. Explain your reasoning.

7.) 9, 12, 15

8.)



9.) 9.9, 2, 10.1

Directions: Solve for the variable and express the answer in simplest radical form.

Bonus

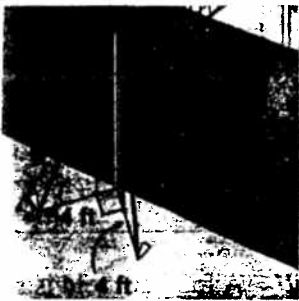
10.) $\frac{x+3}{7} = \frac{5}{x-3}$

Directions: Solve for the variable and express the answer to the nearest tenth.

Bonus

11.) $(3x-2)(x+1) = x(1+x)$

- 3.) You are setting up a volleyball net. To keep each pole standing straight, you use two ropes and 2 stakes as shown. Find the length of each piece of rope in simplest radical form.



- 4.) Find the lengths of the sides of a right triangle if their sides are represented as consecutive even integers.

Regents Algebra: Assignment
Pythagorean Theorem Applications

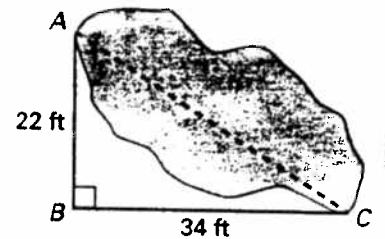
Name _____

Date _____

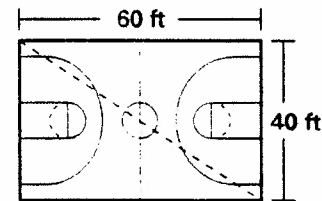
Directions: Answer each of the questions below. Show all of your work neatly on your own paper.

- 1.) A wire stretches from the top of a pole 24 feet high to a stake in the ground that is 18 feet from the foot of the pole. Find the length of the wire to the nearest tenth of a foot.
- 2.) A rectangle has a diagonal of length 10 cm and one side of length 6 cm. Find the perimeter of the rectangle.

- 3.) You are trying to determine the distance across a lake. You lay out posts at A, B and C so that angle B is a right angle. You measure and find the length of AB to be 22 feet and CB to be 34 feet. How wide is the lake from A to C? (to the nearest hundredth)



- 4.) A basketball court is a rectangle. If the court measures 60 feet by 40 feet, what is the length of the diagonal from one corner of the court to the opposite corner? (Express the answer in simplest radical form)



- 5.) A ladder is placed 4 feet from the foot of a wall. The top of the ladder reaches a point 8 feet above the ground. Find the length of the ladder? (Express the answer in simplest radical form)
- 6.) If the hypotenuse of a right triangle measures 10 cm and one leg is two more than the other, find the length of each leg.
- 7.) If the length of one leg of a right triangle is $4\sqrt{3}$ and the hypotenuse is twice the length of the other leg, find the length of each side of the triangle.
- 8.) If the legs of a right triangle are represented as consecutive odd integers and the length of the hypotenuse is 5, find the length of each leg.



Practice with
Simplifying Radicals
 Topic Index | Algebra Index | Regents Exam Prep Center

Perform the indicated operations and simplify the answers:

1.

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



Choose:

- $\sqrt{3}$
- 0
- $12\sqrt{3}$
- $-4\sqrt{3}$

2.

$$-\sqrt{128}$$



Choose:

- $-64\sqrt{2}$
- 4
- $-2\sqrt{8}$
- $-8\sqrt{2}$

3.

$$\sqrt{21} - \sqrt{3}$$



Choose:

- $2\sqrt{6}$
- 7
- $3\sqrt{7}$
- $9\sqrt{7}$

4.

$$\frac{20\sqrt{50}}{4\sqrt{2}}$$




Choose:

- 25
- $5\sqrt{5}$
- $16\sqrt{48}$
- $5\sqrt{10}$

5. $\frac{14\sqrt{150}}{7\sqrt{2}}$  Choose:

$7\sqrt{3}$
 $10\sqrt{2}$
 $\sqrt{150}$
 $10\sqrt{3}$

6. $3\sqrt{2} + 2\sqrt{32}$  Choose:


$8\sqrt{2}$
 $5\sqrt{2}$
 $11\sqrt{2}$
 $5\sqrt{34}$

7. $2\sqrt{45}$  Choose:

$6\sqrt{5}$
 $18\sqrt{5}$
 $10\sqrt{3}$
 $10\sqrt{5}$

8. $5\sqrt{8} \cdot 7\sqrt{3}$  Choose:


$35\sqrt{5}$
 $70\sqrt{6}$
 $140\sqrt{6}$
 $-2\sqrt{5}$

9. $3\sqrt{5} + 6\sqrt{2} - 3\sqrt{2} + \sqrt{5}$  Choose:

$7\sqrt{7}$
 $12\sqrt{10}$
 $2\sqrt{5} + 3\sqrt{2}$
 $4\sqrt{5} + 3\sqrt{2}$

BONUS

10. **Challenger:**
 $(5+\sqrt{2})(6+\sqrt{2})$




Choose:

- 36
- $32+11\sqrt{2}$
- $34+11\sqrt{2}$
- $30+11\sqrt{2}$

11.

$(\sqrt{7}-3)^2$




Choose:

- $-2-6\sqrt{7}$
- $7-6\sqrt{7}$
- $9-6\sqrt{7}$
- $16-6\sqrt{7}$

12. **Choose:**

$\frac{21}{7\sqrt{2}}$ $\frac{3}{2}$ $\frac{3\sqrt{2}}{2}$ $\frac{3\sqrt{2}}{14}$ $\frac{3\sqrt{3}}{2}$




Regents Algebra: Assignment
Operations with Radicals Review

Name _____

Date _____

Examples: Perform the indicated operation and express the result in simplest radical form.

1.) $\sqrt{8} - \sqrt{2}$

2.) $2\sqrt{150} - \frac{3}{8}\sqrt{96}$

3.) $(\sqrt{5})(8\sqrt{3})$

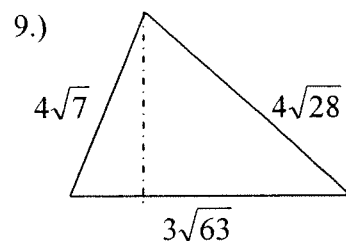
4.) $(4\sqrt{2})(2\sqrt{8})$

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

6.) $\frac{14\sqrt{3}}{2\sqrt{3}}$

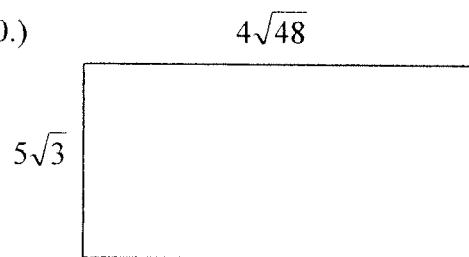
7.) $\frac{2\sqrt{24}}{6\sqrt{6}}$

Directions: Find the perimeter and express the answer in simplest radical form.

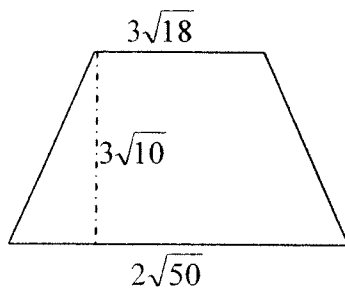


Directions: Find the area of each of the following and express the answer in simplest radical form.

10.)



11.)



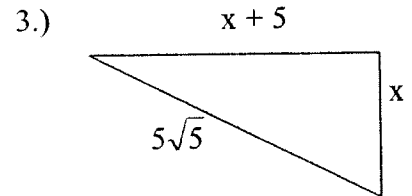
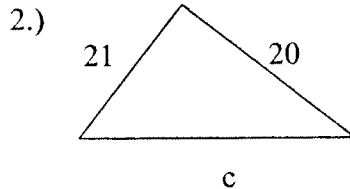
Regents Algebra: Pythagorean Theorem
 and its Converse ~~Homework~~ Review
 CW

Name _____

Date _____

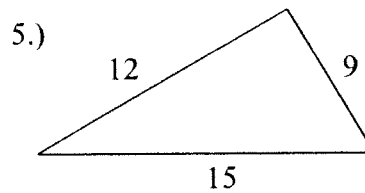
Directions: Find the missing length(s) of the right triangle and express their lengths in simplest radical form where appropriate. Show all of your work, neatly in the space provided.

1.) $b = 11, c = 61$



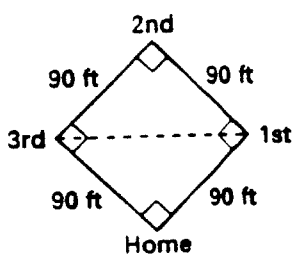
Directions: Determine whether the given lengths are sides of a right triangle. Explain your reasoning.

4.) $5, 5, 5\sqrt{2}$

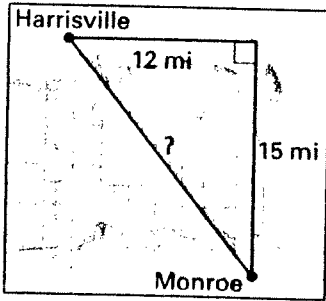


Directions: Solve each of the problems below. Show all of your work!!!!!!

6.) The infield of a baseball field is a square. The distance between the bases is 90 feet. How far is it from first base to third base? (Express the answer in simplest radical form)



- 7.) You are traveling from Monroe to Harrisville. You can avoid the city traffic by staying on the roads shown. If you travel straight through the city, how many miles will you save? (Express the answer to the nearest mile)



- 8.) If the length of one leg of a right triangle is three less than the other and the hypotenuse is 15, find the length of each leg.

- 9.) If the length of one leg of a right triangle is $6\sqrt{5}$ and the hypotenuse is twice the length of the other leg. Find the length of the leg and the hypotenuse to the nearest tenth.

Regents Algebra: Pythagorean Theorem
and its Converse ~~Class-Work~~ Review

HW

Name _____

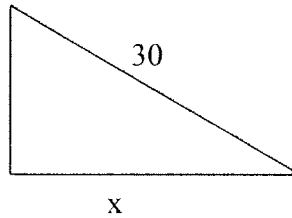
Date _____

Directions: Find the missing length(s) of the right triangle and express their lengths in simplest radical form where appropriate. Show all of your work, neatly in the space provided.

1.) $a = 9, c = 16$

2.)

$x - 6$



Directions: Determine whether the given lengths are sides of a right triangle. Explain your reasoning.

3.) 11, 60, 62

Directions: Solve each of the problems below. Show all of your work!!!!!!

4.) A painter has a 15 foot ladder. If the bottom of the ladder is 7 feet from the wall, how high on the wall does the ladder reach? (Express the answer to the nearest tenth of a foot)

5.) If the length of a diagonal of a square is 10, what is the length of a side of a square? (Express the length in simplest radical form)