Squares and Square Roots

Math 8 11.1

To square a number, multiply the number by itself.

Practice: Solve.

1. 12^2 **2.** 0.6^2 **3.** $(-9)^2$ **4.** $\left(\frac{10}{11}\right)^2$

Squares and Square Roots are Inverse Operations.
If $x^2=y$ then x is a square root of y.

Every positive number has two square roots. You will only need to indicate the positive square root of a number unless this symbol appears before the radical:

$$\pm\sqrt{}$$

Practice: Solve without a calculator.

1. $\sqrt{49}$ **2.** $\sqrt{0.25}$ **3.** $\sqrt{\frac{4}{9}}$ **4.** $\pm\sqrt{810{,}000}$

The following square roots should be easy to calculate in your head.
Double check by squaring your answer.

Practice: Solve without a calculator.

1. $\sqrt{12{,}100}$ **2.** $\sqrt{0.16}$ **3.** $\sqrt{10{,}000}$

4. $\sqrt{1.44}$ **5.** $\sqrt{0.0001}$ **6.** $\sqrt{640{,}000}$

How about $\sqrt{49{,}000}$?

Squares and Square Roots

Math 8 11.1

Simplifying radical expressions.
There are several easy rules you must know for simplifying square roots.

Fractions:

$$\sqrt{\frac{49}{64}} = \frac{\sqrt{49}}{\sqrt{64}} = \frac{7}{8} \qquad \sqrt{\frac{100}{9}} = \frac{10}{3} \qquad \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Products:

$$\sqrt{81 \cdot 121} = \sqrt{81} \cdot \sqrt{121} = 9 \cdot 11 = 99 \qquad \sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

Practice: Solve without a calculator.

1. $\sqrt{\frac{9}{100}}$
2. $\sqrt{25 \cdot 144}$
3. $\sqrt{\frac{169}{400}}$
4. $\sqrt{\frac{25}{6{,}400}}$
5. $\sqrt{32 \cdot 50}$ (tricky… think!)

Squares and Square Roots

Math 8 11.1

Simplifying irrational radical expressions.
Irrational numbers are non-terminating, non-repeating decimals.
Some square roots cannot be simplified into integers, fractions, or decimals.

Example: Simplify.

1. $\sqrt{40}$ **2.** $\sqrt{75}$ **3.** $\sqrt{\frac{18}{25}}$

Practice: Simplify.

1. $\sqrt{490}$ **2.** $\sqrt{99}$ **3.** $\sqrt{\frac{48}{49}}$

Multiplying Radical Expressions.
Use the rules we have discovered to simplify these more difficult expressions.

Examples: Simplify.

1. $2\sqrt{5} \cdot 3\sqrt{15}$ **2.** $\sqrt{35} \cdot 3\sqrt{5}$ **3.** $\sqrt{\frac{6}{35}} \cdot \sqrt{\frac{50}{21}}$

Practice: Simplify.

1. $5\sqrt{3} \cdot 2\sqrt{15}$ **2.** $\sqrt{18} \cdot 2\sqrt{6}$ **3.** $\sqrt{\frac{49}{10}} \cdot \sqrt{\frac{5}{18}}$

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

1. $\sqrt{1.21} =$

2. $\sqrt{4{,}900} =$

3. $\sqrt{36 \cdot 81} =$

4. $\sqrt{16 \cdot 169} =$

5. $\sqrt{32} =$

6. $\sqrt{75} =$

7. $\sqrt{\frac{25}{64}} =$

8. $\frac{\sqrt{4}}{\sqrt{144}} =$

9. $\sqrt{\frac{1}{9}} =$

10. $3\sqrt{490} =$

11. $2\sqrt{3} \cdot 5\sqrt{15} =$

12. $2\sqrt{5} \cdot 3\sqrt{10} =$

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

13. $\sqrt{150}$

14. $\sqrt{810}$

15. $\dfrac{\sqrt{8}}{\sqrt{50}}$

16. $\dfrac{4\sqrt{3}}{\sqrt{75}}$

17. $\dfrac{\sqrt{5}}{\sqrt{20}} =$

18. $\dfrac{\sqrt{45}}{\sqrt{5}} =$

19. $\dfrac{\sqrt{15}}{\sqrt{60}}$

20. $\dfrac{\sqrt{75}}{\sqrt{3}}$

21. $\dfrac{\sqrt{2}}{\sqrt{15}} \cdot \dfrac{\sqrt{12}}{\sqrt{5}}$

22. $\dfrac{\sqrt{15}}{\sqrt{98}} \cdot \dfrac{\sqrt{18}}{\sqrt{5}}$

Squares and Square Roots

Math 8

You can also simplify square roots which include variables:
For example, try the following:

$\sqrt{x^2}$

Note: This actually works only when x is positive, for example, $\sqrt{(-7)^2} \neq -7$

For our practice, we will assume that x represents a positive value. You could also say that $\sqrt{x^2} = \pm x$, but we will avoid this notation for now.

Examples:

1. What about $\sqrt{x^4}$?
2. Now try $\sqrt{x^{16}}$ but be careful!
3. How could you simplify $\sqrt{x^{25}}$?

Practice:
Don't be tricked by these easy ones!

Examples: Simplify.

1. $\sqrt{x^6}$ **2.** $\sqrt{x^{100}}$ **3.** $\sqrt{x^{49}}$ **4.** $\sqrt{9x^2y^3}$ **5.** $\sqrt{\frac{1}{4x^2y^6}}$

Practice: Simplify.

1. $\sqrt{x^{12}}$ **2.** $\sqrt{x^{10}}$ **3.** $\sqrt{x^{81}}$ **4.** $\sqrt{300x^6}$ **5.** $\sqrt{\frac{25x^2}{4}}$

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. Begin by writing each as a product of perfect squares where necessary.

1. $\sqrt{x^6}$

2. $\sqrt{a^{18}}$

3. $\sqrt{c^{12}}$

4. $\sqrt{y^{40}}$

5. $\sqrt{x^2 y^2}$

6. $\sqrt{16x^{16}}$

7. $\sqrt{4x}$

8. $\sqrt{18a^{24}}$

9. $\sqrt{c^{144}}$

10. $\sqrt{y^{25}}$

11. $\sqrt{250x^2}$

12. $\sqrt{40x^{10}}$

13. $\dfrac{\sqrt{20x^{12}}}{\sqrt{25}}$

14. $\dfrac{\sqrt{x^{12}}}{\sqrt{y^{10}}}$

15. $\dfrac{\sqrt{18x^8}}{\sqrt{9}}$

16. $\dfrac{\sqrt{2a^2}}{\sqrt{8b^6}}$

17. $\sqrt{3x} \cdot \sqrt{12x^3}$

18. $\sqrt{11ab} \cdot \sqrt{11a^5b^7}$

Rationalizing the Denominator

Math 8 11.4

Simplified Radicals must NOT have a radical in the denominator.
Removing the radical is called **Rationalizing the Denominator.**

Examples: Simplify.

1. $\dfrac{3}{\sqrt{5}}$ 2. $\sqrt{\dfrac{1}{2}}$ 3. $\sqrt{\dfrac{35}{112}}$

Practice: Simplify.

1. $\dfrac{3}{\sqrt{15}}$ 2. $\sqrt{\dfrac{3}{8}}$ 3. $\sqrt{\dfrac{12}{21}}$

4. $\dfrac{3}{\sqrt{2}} \cdot \dfrac{\sqrt{5}}{4}$ 5. $\sqrt{\dfrac{8x}{5}} \cdot \sqrt{\dfrac{2x}{3y}}$

Combining Like Radicals

Examples: Simplify.

1. $3\sqrt{5}+7\sqrt{5}$ 2. $4\sqrt{7}-\sqrt{7}$ 3. $\sqrt{24}+\sqrt{150}$

Practice: Simplify.

1. $6\sqrt{2}+\sqrt{2}$ 2. $7\sqrt{3}-\sqrt{48}$ 3. $\sqrt{20}+\sqrt{45}$

Harder Practice: Simplify.

1. $\dfrac{5\sqrt{3}+\sqrt{3}}{2}$ 2. $\dfrac{5\sqrt{2}}{7}+\dfrac{2\sqrt{2}}{7}$ 3. $\dfrac{\sqrt{12}}{7}+\dfrac{\sqrt{27}}{14}$

Radicals Quiz Review

Math 8 11.4

Simplify:

100. $\sqrt{75}$

200. $2\sqrt{6}\cdot 3\sqrt{30}$

300. $\sqrt{\frac{2}{5}}\cdot\sqrt{\frac{3}{10}}$

400. $\sqrt{\frac{5}{8}}\cdot\sqrt{\frac{12}{2}}$

Addition/Subtraction (Like Terms):
Simplify each:

100. $2\sqrt{5}+3\sqrt{5}$

200. $\sqrt{8}+\sqrt{18}$

300. $\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{3}$

400. $\sqrt{75}-\sqrt{12}+\sqrt{48}$

Rationalizing the Denominator:
Simplify and Rationalize each denominator.

100. $\frac{4}{\sqrt{5}}$

200. $\sqrt{\frac{40}{3}}$

300. $\frac{2}{\sqrt{3}}+\frac{7}{\sqrt{3}}$

400. $\frac{\sqrt{14}}{7}+\frac{3}{\sqrt{14}}$

Name_____ Period _____

Radicals Practice Quiz

Math 8 11.4

Simplify each: Answers should be in simplest radical form. Rationalize all denominators.
CALCULATORS WILL NOT BE ALLOWED ON THIS QUIZ.

1. $\sqrt{121}$

1. _____

2. $\sqrt{2{,}500}$

2. _____

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

3. _____

4. $\sqrt{44}$

4. _____

5. $\sqrt{a^6}$ (Assume $a > 0$)

5. _____

6. $\sqrt{12} \cdot \sqrt{3}$

6. _____

7. $\sqrt{\frac{18}{49}}$

7. _____

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

8. _____

Name_____ Period _____

Radicals Practice Quiz

Math 8 11.4

Simplify each: Answers should be in simplest radical form. Rationalize all denominators.
CALCULATORS WILL NOT BE ALLOWED ON THIS QUIZ.

9. $\sqrt{25 \cdot 49}$

9. _____

10. $\sqrt{\frac{32}{81}}$

10. _____

11. $\sqrt{4x^5y^{16}}$

11. _____

12. $\sqrt{8a^6}$

12. _____

13. $\sqrt{12}+5\sqrt{3}$

13. _____

14. $\sqrt{72}-\sqrt{50}$

14. _____

15. $\sqrt{2}\left(\sqrt{6}+\sqrt{24}\right)$

15. _____

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

1. $\sqrt{121} =$

2. $\sqrt{0.36} =$

3. $\sqrt{1.44} =$

4. $\sqrt{225} =$

5. $\sqrt{60} =$

6. $\sqrt{50} =$

7. $\sqrt{40} =$

8. $\sqrt{27} =$

9. $\sqrt{144 \cdot 25} =$

10. $\sqrt{21 \cdot 6} =$

11. $\sqrt{9 \cdot 225} =$

12. $\sqrt{30 \cdot 18} =$

13. $\sqrt{11 \cdot 22} =$

14. $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5} =$

15. $\sqrt{\frac{36}{49}} =$

16. $\sqrt{\frac{4}{169}} =$

17. $\sqrt{\frac{5}{25}} =$

18. $\sqrt{\frac{11}{44}} =$

19. $\sqrt{\frac{27}{64}} =$

20. $\sqrt{\frac{12}{25}} =$

21. $\sqrt{\frac{12}{3}} =$

22. $\frac{\sqrt{5}}{\sqrt{7}} =$

23. $\sqrt{\frac{49}{3}} =$

24. $\frac{8}{\sqrt{2}} =$

25. $\sqrt{\frac{13}{32}} =$

26. $\sqrt{\frac{16}{15}} \cdot \frac{\sqrt{3}}{\sqrt{8}} =$

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

27. $\sqrt{x^6} =$

28. $\sqrt{x^7} =$

29. $\sqrt{x^8} =$

30. $\sqrt{x^9} =$

31. $\sqrt{xy^2} =$

32. $\sqrt{x^{25}y^{49}} =$

33. $\sqrt{4x^3} =$

34. $\sqrt{12x^9y^2} =$

35. $\sqrt{144x} \cdot \sqrt{x} =$

36. $\sqrt{21x} \cdot \sqrt{7x^9} =$

37. $3\sqrt{2} + 2\sqrt{2} =$

38. $\sqrt{12} + 5\sqrt{3} =$

39. $\sqrt{54} + \sqrt{24} =$

40. $\sqrt{9x} + \sqrt{4x} =$

41. $\sqrt{\frac{x^2}{y^4}} =$

42. $\sqrt{\frac{4x^9}{25}} =$

43. $\sqrt{\frac{a^9}{a^7}} =$

44. $\sqrt{\frac{1}{a^8}} =$

45. $\frac{\sqrt{x}}{\sqrt{4x}} =$

46. $\sqrt{\frac{12xy}{3y}} =$

47. $\frac{2}{\sqrt{x}} =$

48. $2\sqrt{7}\left(\sqrt{7} - 2\right) =$

49. $\frac{36\sqrt{2} + 8\sqrt{3}}{4} =$

50. $(\sqrt{3} - 4\sqrt{2})(\sqrt{3} + 4\sqrt{2}) =$

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

1. $\sqrt{144} =$

2. $\sqrt{0.49} =$

3. $\sqrt{1.21} =$

4. $\sqrt{900} =$

5. $\sqrt{48} =$

6. $\sqrt{72} =$

7. $\sqrt{45} =$

8. $\sqrt{32} =$

9. $\sqrt{49 \cdot 100} =$

10. $\sqrt{15 \cdot 18} =$

11. $\sqrt{6 \cdot 24} =$

12. $\sqrt{17 \cdot 17} =$

13. $\sqrt{40 \cdot 20} =$

14. $\sqrt{2 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 7} =$

15. $\sqrt{\frac{33}{11}} =$

16. $\sqrt{\frac{49}{169}} =$

17. $\sqrt{\frac{8}{64}} =$

18. $\sqrt{\frac{7}{63}} =$

19. $\sqrt{\frac{20}{25}} =$

20. $\sqrt{\frac{40}{18}} =$

21. $\sqrt{\frac{7}{8}} =$

22. $\frac{\sqrt{10}}{\sqrt{3}} =$

23. $\sqrt{\frac{16}{3}} =$

24. $\frac{4}{3\sqrt{2}} =$

25. $\sqrt{\frac{3}{44}} =$

26. $\sqrt{\frac{14}{15}} \cdot \frac{\sqrt{3}}{\sqrt{7}} =$

Name_____ Period _____

Squares and Square Roots

Math 8 11.1

Practice: Simplify completely. All answers should be left in radical form. DO NOT USE A CALCULATOR.

27. $\sqrt{x^{16}} =$

28. $\sqrt{x^{25}} =$

29. $\sqrt{x^{36}} =$

30. $\sqrt{x^{49}} =$

31. $\sqrt{ax^{6}} =$

32. $\sqrt{x^{3}y^{5}} =$

33. $\sqrt{9x^{9}} =$

34. $\sqrt{2x^{2}y^{2}} =$

35. $\sqrt{2x} \cdot \sqrt{2} =$

36. $\sqrt{15x^{3}} \cdot \sqrt{5x^{5}} =$

37. $5\sqrt{7} + 6\sqrt{7} =$

38. $\sqrt{32} + 5\sqrt{2} =$

39. $\sqrt{20} + \sqrt{45} =$

40. $\sqrt{25x^{2}} + \sqrt{16x^{2}} =$

41. $\sqrt{\dfrac{a^{12}}{b^{6}}} =$

42. $\sqrt{\dfrac{2x^{3}}{9x}} =$

43. $\sqrt{\dfrac{x^{23}}{x^{17}}} =$

44. $\sqrt{\dfrac{2}{x^{8}}} =$

45. $\dfrac{\sqrt{x}}{2\sqrt{y}} =$

46. $\sqrt{\dfrac{24x^{2}}{3y}} =$

47. $\dfrac{2x}{\sqrt{x^{3}}} =$

48. $3\sqrt{5}\left(3\sqrt{5} - 2\right) =$

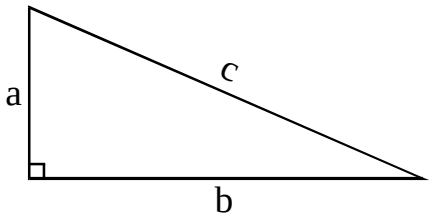
49. $\dfrac{15\sqrt{3} + 25\sqrt{5}}{10} =$

50. $(3\sqrt{3} - \sqrt{2})(3\sqrt{3} + \sqrt{2}) =$

The Pythagorean Theorem

Math 8

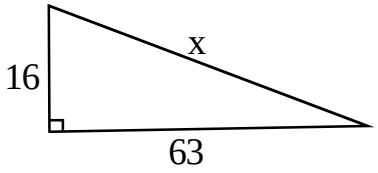
The Pythagorean Theorem:
The sum of the squares of the legs of a right triangle is equal to the square of its hypotenuse.



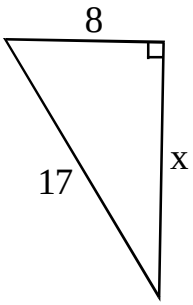
Simply: $a^2 + b^2 = c^2$
Where a and b are the legs and c is the hypotenuse.
The hypotenuse is the longest side, always opposite the right angle.

Examples: Find the missing length x.

1.

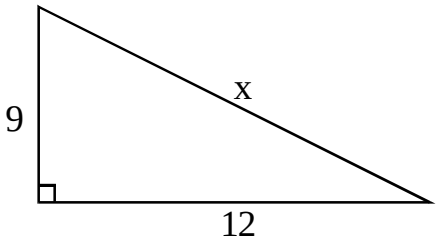


2.

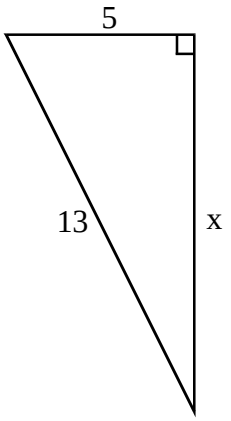


Practice: Find the missing length x.

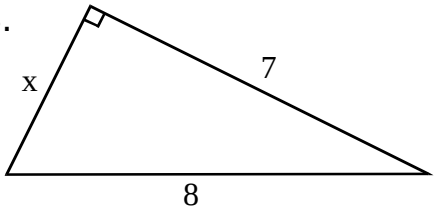
1.



2.

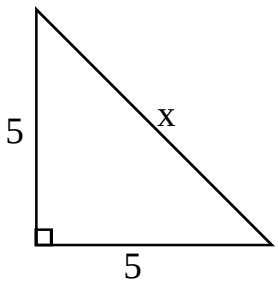


3.

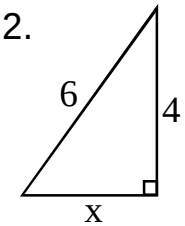


Practice: Find the missing length x. LEAVE ANSWERS IN RADICAL FORM.

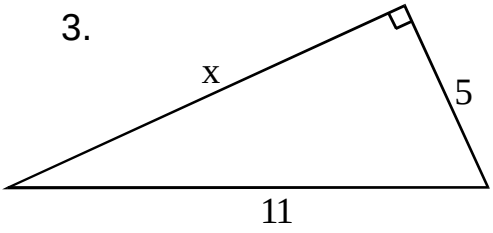
1.



2.



3.



The Pythagorean Theorem

Math 8 11.2

Many word problems can be solved using the Pythagorean Theorem.

Examples: Solve each using the Pythagorean Theorem.

1. A rectangle has a diagonal length of 7cm and a width of 3cm. Find its area (leave in simplified radical form).

2. The wire supporting a 20-foot tall phone pole is attached to the top of the pole, and to the ground 12 feet from the pole. How long is the wire?

Practice: Solve each using the Pythagorean Theorem.

1. Find the hypotenuse of a right triangle whose legs are 7 and 24 inches long.

2. What is the length of the diagonal of a square that has 2-inch sides? (Leave in simplified radical form.)

3. If you walk 1 mile north, then 3 miles east, then three miles north, how far will you be from where you started?

Pythagorean Triples: You can determine whether a triangle is a right triangle by testing the sides using the Pythagorean Theorem.

Examples: Which of the lengths below could be the sides of a right triangle?

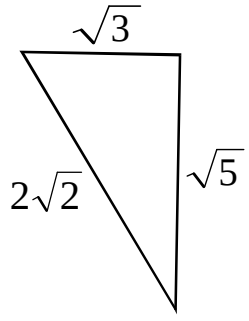
1. 3-4-5 **2.** 5-7-9 **3.** 20-21-29

Practice: Which of the lengths below could be the sides of a right triangle?

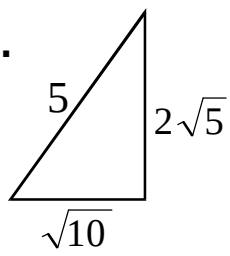
1. 6-7-8 **2.** 6-8-10 **3.** 5-12-13 **4.** 7-23-24

Practice: Which triangle is a right triangle?

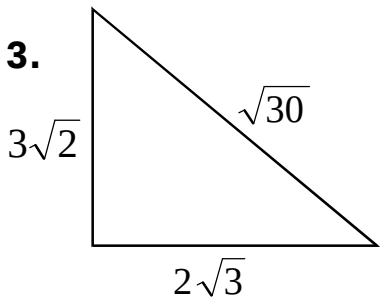
1.



2.



3.

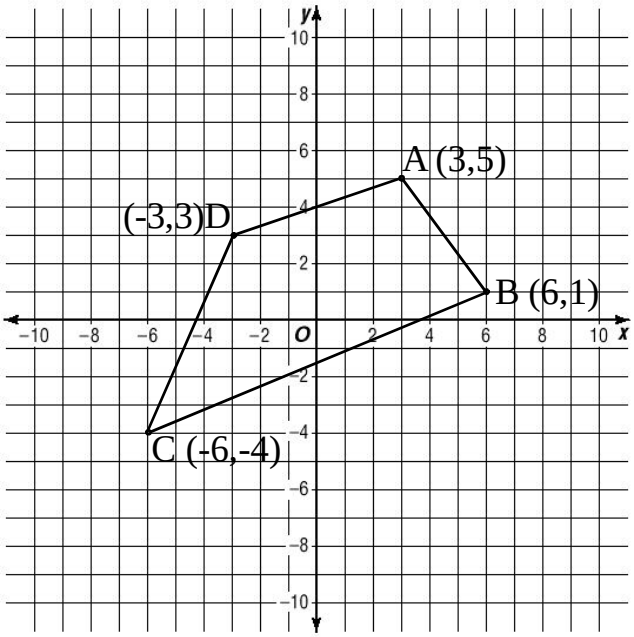


Distance on the Plane

Math 8 11.2

You can use the Pythagorean Theorem to find the distance between two points on the coordinate plane.

Practice:
Find the length of each segment on the coordinate plane below:



AB = _____

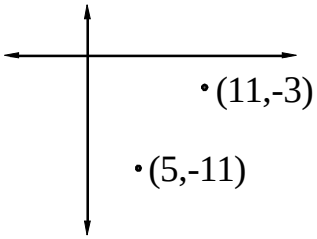
BC = _____

CD = _____

AD = _____

Of course, the distance between two points on the plane can be found without graphing:

Example:
Find the distance between the points (11,-3) and (5,-11) on the plane.



Given any two points: (x_1, y_1) and (x_2, y_2):
The distance between two points on the plane is the hypotenuse of a right triangle with a width of _____ and a height of _____.

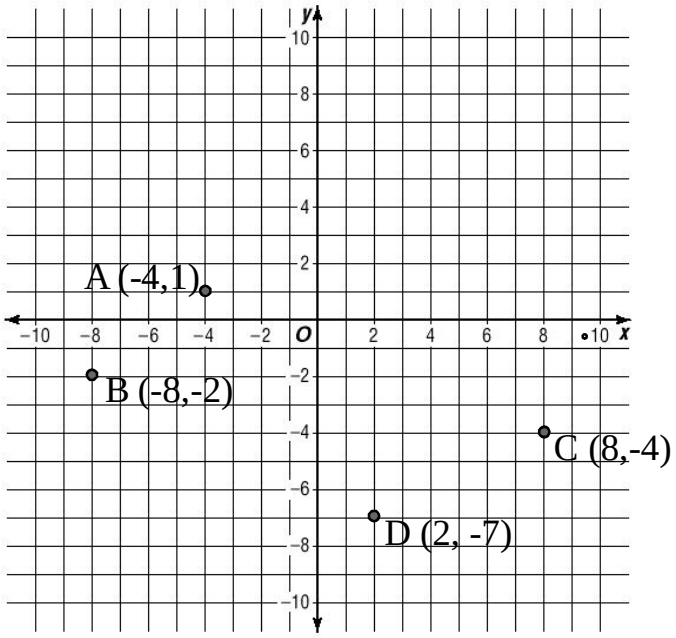
The **distance formula** IS based on the pythagorean theorem:

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2 \qquad d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Distance on the Plane

Math 8 11.2

Practice:
Find the distance between each pair of points below:



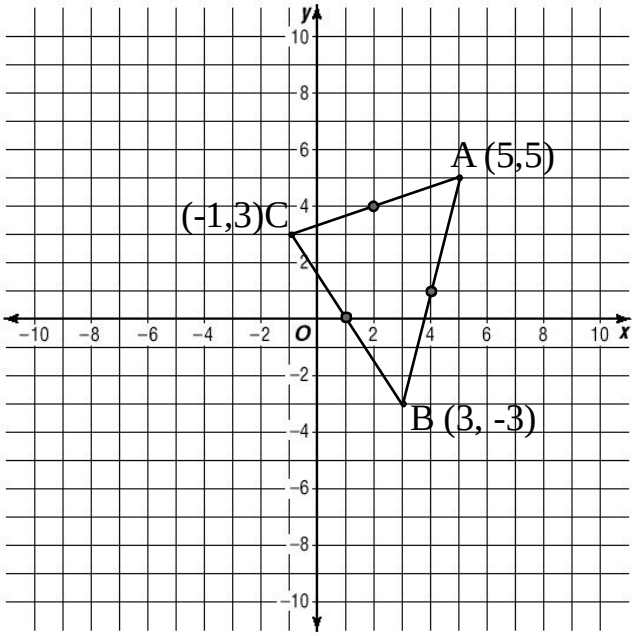
A(-4,1) to B(-8, -2) = _____

A(-4, 1) to C(8, -4) = _____

A(-4, 1) to D(2, -7) = _____

C(8, -4) to D(2, -7) = _____
(leave in radical form)

Midpoint:
Try to find the midpoint of each segment below. Look for a relationship that would help you find the midpoint without graphing.



midpoint of AB = _____

midpoint of BC = _____

midpoint of AC = _____

Try to write the midpoint formula on your own.
Practice: What is the midpoint fr segment MN for M(22, -15) and N(2, -3)

Name_____ Period _____

Pythagorean Problems (Easier)

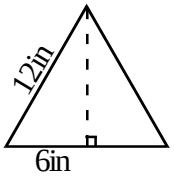
Math 8 11.2

Practice:

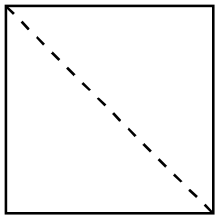
Solve each using the Pythagorean Theorem:

_____ **1.** Patrick rides his bicycle 4 miles south, then 8 miles west. How far is he from where he started (in simplest radical form)?

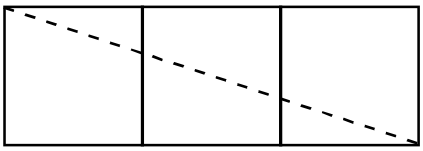
_____ **2.** An equilateral triangle has 1-ft sides. What is its height (in simplest radical form)?



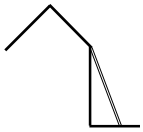
_____ **3.** What is the diagonal length of a square whose sides are 6cm long?



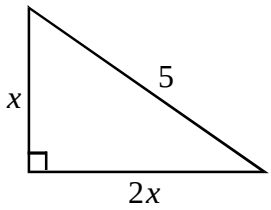
_____ **4.** The rectangle below is made up of three congruent squares. The rectangle has a perimeter of 24cm. What is the length of the dashed diagonal?



_____ **5.** A 25-foot ladder rests against a wall so that the bottom of the ladder is 7 feet away from the wall. How high above the ground is the top of the ladder?



_____ **6.** Solve for x:



Name_____ Period _____

Pythagorean Problems (Harder)

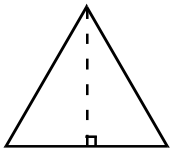
Math 8 11.2

Practice:

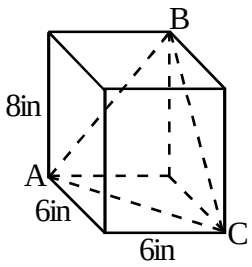
Solve each using the Pythagorean Theorem:

_____ **1.** Turner rides his bicycle 5 miles south, then 7 miles west, then 1 mile north. How far is he from where he started (to the tenth of a mile)?

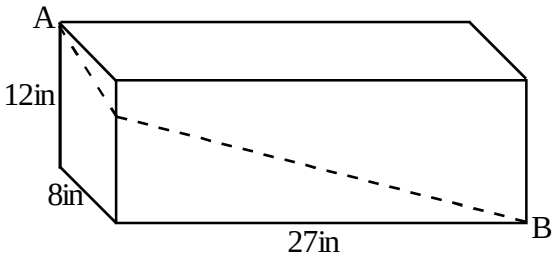
_____ **2.** An equilateral triangle has 4-inch sides. What is its height (in simplest radical form)?



_____ **3.** Triangle ABC is inscribed (drawn within) in the prism on the right. What is the perimeter of triangle ABC (in simplest radical form)?

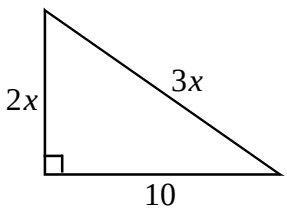


_____ **4.** An ant is crawling along the outside of the box below. How far will he walk from A to B along the path shown (think about unfolding the box to solve this problem).



_____ **5.** A 41-foot ladder rests against a wall so that the top of the ladder is 40 feet from the ground. How far from the wall is the bottom of the ladder?

_____ **6.** Solve for x:



Name_____ Period _____

Pythagorean Review

Math 8 11.2

Solve:

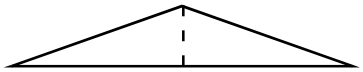
1. The hypotenuse of a right triangle is 45cm, and one of its legs is 36cm. Find its perimeter.

1. _____

2. A fifteen-foot ladder reaches the top of a 13-foot wall. How far is the base of the ladder from the base of the wall? (leave in radical form)

2. _____

3. An isosceles triangle has two congruent 11-inch sides, and an 18-inch base. What is its area (in simplest radical form)?



3. _____

4. Huntersville is 21 miles due south of Statesville and 20 miles due west of Concord. How many miles is it from Statesville to Concord?

4. _____

5. If you drive 3 miles west, then 5 miles south, and finally 15 miles east, how far will you end up from where you started?

5. _____

Name_____ Period _____

Pythagorean Review

Math 8 11.2

Answer each: Leave irrational answers in simplest radical form.

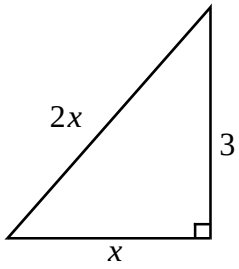
6. The area of a square is $25cm^2$. What is the length of its diagonal?

6. _____

7. The area of a square is $18cm^2$. What is the length of its diagonal?

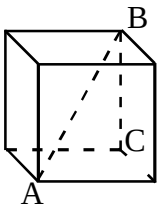
7. _____

8. Solve for x:



8. _____

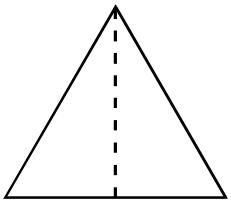
9. A cube has two-inch edges. What is the distance between opposite corners A and B of the cube? (leave in radical form)



9. _____

Hint: find AC, then AB is the hypotenuse of triangle ABC.

10. An equilateral triangle has 8-inch sides. What is the area of the triangle? (leave in radical form)



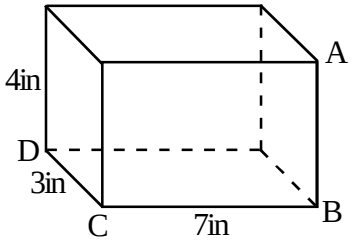
10. _____

Pythagorean Review

Math 8 11.2

Right Triangles are EVERYWHERE!

Prisms:



Name the right triangles you can find in this figure (using only A, B, C and D):

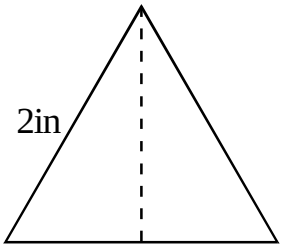
Now find the distance from: A to C, B to D, and A to D.

Non-Right Triangles:

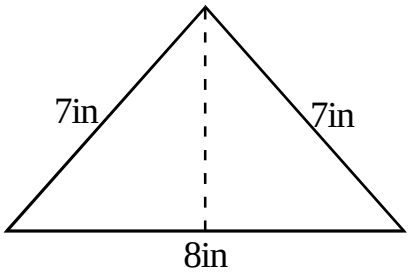
You can use the Pythagorean Theorem to find the altitude (height) of triangles.

Practice: Find each height.

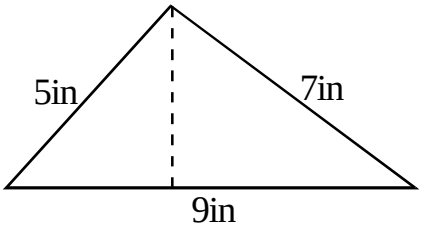
1. (equilateral)



2. (Isosceles)



3. (scalene… much harder!)

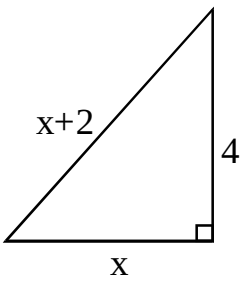


More work with variables:

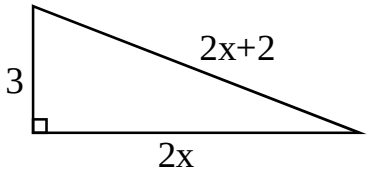
The Pythagorean Theorem works even without numbers.

Practice: Solve for x in each.

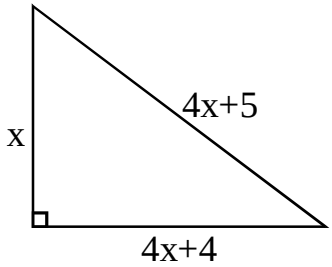
1.



2. (leave as a fraction)



3. (solve as a quadratic)



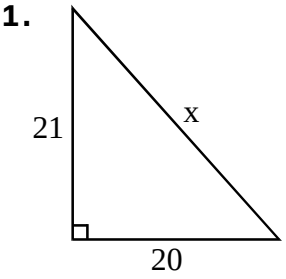
Name_____ Period _____

Pythagorean Practice Quiz

Math 8 11.4

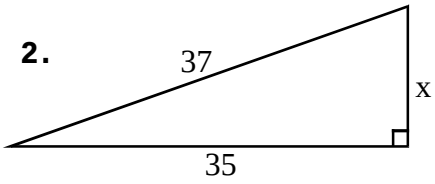
Find the missing length x for each diagram below. Leave all irrational answers in radical form.

1.



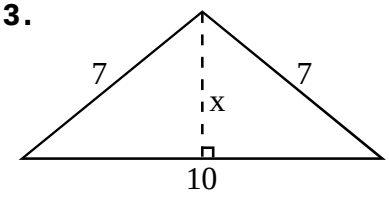
1. x=_____

2.



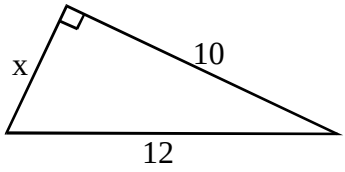
2. x=_____

3.



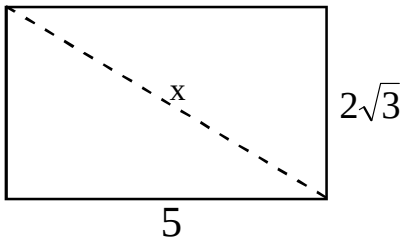
3. x=_____

4.



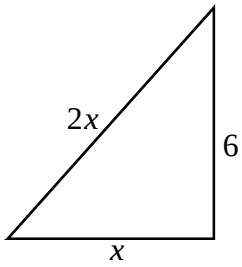
4. x=_____

5. (rectangle)



5. x=_____

6.



6. x=_____
(in simplest radical form)

Name_____ Period _____

Pythagorean Practice Quiz

Math 8

Solve each. Leave answers in simplest radical form unless noted otherwise.

7. What is the area of an equilateral triangle with 6-inch sides (leave answer in simplest radical form).

7. _____

8. Kyle walks 40 meters north, then 18 meters east, then 16 meters south, then directly back to where he started. How far did he walk **altogether**? (Round to the tenth of a meter.)

8. _____

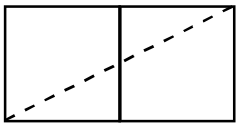
9. The wires that support a 90-foot antenna are 92 feet long. How far from the base of the tower are the wires attached? (in simplest radical form)

9. _____

10. Find the distance between the following pair of points (to the nearest tenth): (9, -2) (-1, 5)

10. _____

11. What is the diagonal length of two adjoining squares if the side length of each square is 3cm (in simplest radical form)?



11. _____

Simplify each:

12. $\sqrt{25x^2} =$

12. _____

13. $\sqrt{20} + \sqrt{45} =$

13. _____

14. $\sqrt{900a^6} =$

14. _____

15. $\sqrt{\frac{18}{49}} =$

15. _____

The Pythagorean Theorem

Math 8

A **Pythagorean Triple** is a set of three integers which satisfy the Pythagorean Theorem. For example, the commonly known 3-4-5.

$$3^2 + 4^2 = 5^2$$

More Examples:
Find the missing number in each Pythagorean triple below.

1. 5-__-13 **2.** __-15-17 **3.** 9-40-__

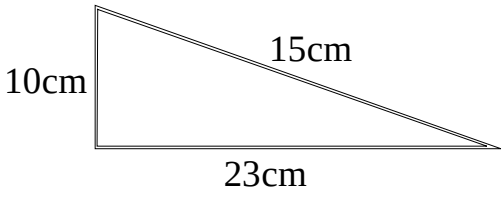
Practice:
Which of the following is a Pythagorean Triple?

1. 8-15-17 **2.** 25-27-37 **3.** 33-56-65

4. 16-63-65 **5.** 21-28-37 **6.** 39-80-89

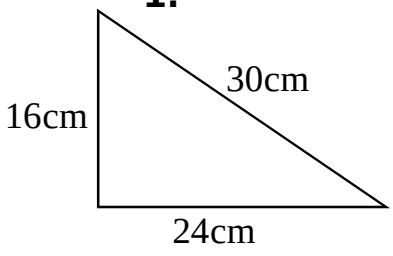
If the sides of a right triangle form a Pythagorean Triple, then the tiangle is a right triangle. For example, if you were asked to find the area of a triangle whose side lengths were 6, 8, and 10cm ... you would know that the triangle was a right triangle ($6^2 + 8^2 = 10^2$).

Example:
Is the triangle shown a right triangle?

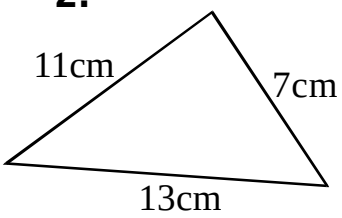


Practice:
Which triangle below is a right triangle?

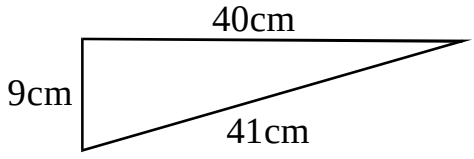
1.



2.



3.



Name_____ Period _____

Pythagorean Triples

Math 8

Find the missing length in each Pythagorean Triple below.
(side lengths are listed in order, least to greatest)

1. 3 - 4 - ___

1. _____

2. 6 - ___ - 10

2. _____

3. 5 - ___ - 13

3. _____

4. 9 - 40 - ___

4. _____

5. ___ - 21 - 29

5. _____

6. 14 - 48 - ___

6. _____

7. 36 - 77 - ___

7. _____

8. 12 - ___ - 37

8. _____

9. ___ - 60 - 61

9. _____

10. 8 - 15 - ___

10. _____

11. ___ - 42 - 58

11. _____

12. 33 - 56 - ___

12. _____

13. ___ - 45 - 53

13. _____

Name_____ Period _____

Review

Math 8

Solve each:

14. Simplify $\sqrt{180}$

14. _____

15. Find the distance between (5, -2) and (-7, 3).

15. _____

16. If Harrison walks 20meters north across a field, then 20 meters west, then 20 meters north again, how far will he have to walk to go directly back to his starting point? Round to the tenth of a meter.

16. _____

17. What is the diagonal length of a rectangle whose side lengths are 12m and 35m long?

17. _____

18. What is the height of an equilateral triangle whose side lengths are 4cm long?

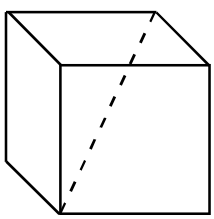
18. _____

19. What is the diagonal length of a square whose side lengths are 7cm long?

19. _____

20. The space diagonal of a cube is the diagonal which connects two vertices that are not on the same face as shown below. What is the length of the space diagonal of a cube whose edges are 3cm long?

20. _____

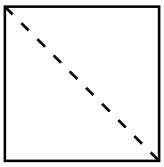


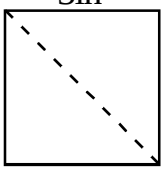
The Pythagorean Theorem

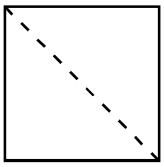
Math 8

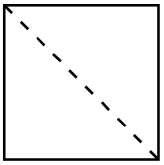
Three easy things to memorize:

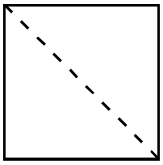
First: The diagonal length of a square.
Find each diagonal length below.

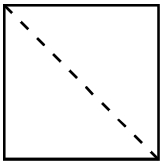
1. 5cm 

2. 3in 

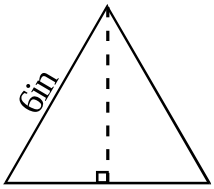
3. 2ft 

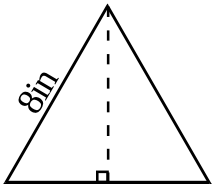
4. 
197mm

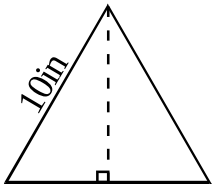
5. 
$\sqrt{3}cm$

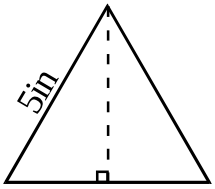
6. 
$2\sqrt{2}cm$

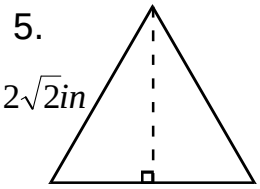
Second: The altitude (height) of an equilateral triangle.
Find each altitude below.

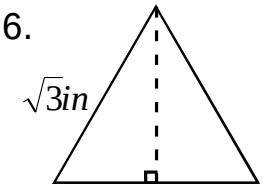
1. 

2. 

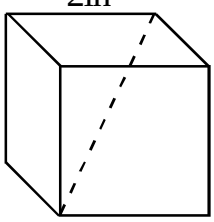
3. 

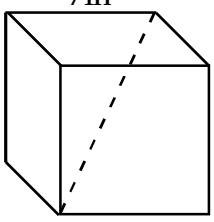
4. 

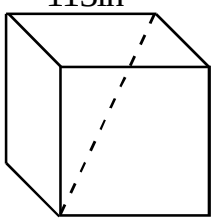
5. 

6. 

Third: The space diagonal of a cube.
Find the length of each space diagonal below.

1. 2in 

2. 7in 

3. 113in 

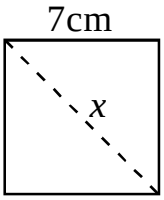
Name_____ Period _____

Diagonals and Altitudes

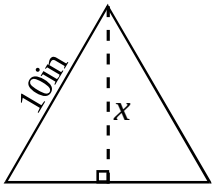
Math 8

Find each missing length x in the diagrams below.

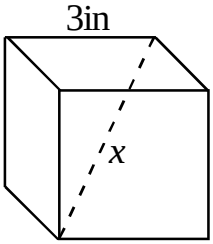
1.



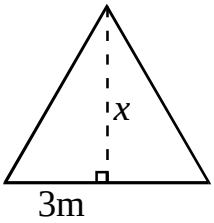
2.



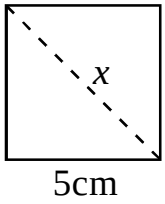
3.



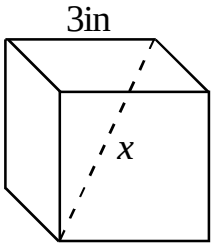
4.



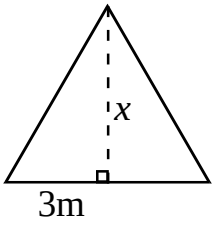
5.



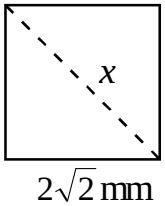
6.



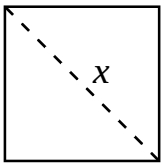
7.



8.

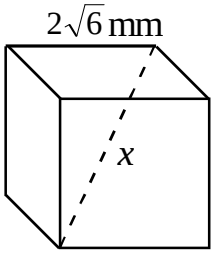


9.

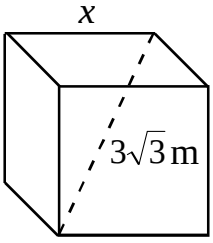


Area = 6cm^2

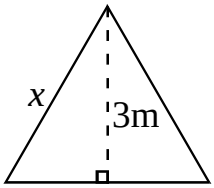
10.



11.



12.



Name_____ Period _____

Review

Math 8

Solve each:

14. Fill-in the blanks with whole numbers: The square root of 130 is less than _____ but greater than _____.

14. _____

15. Find the distance between (-2, -5) and (5, -12) in simplest radical form.

15. _____

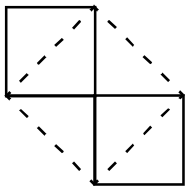
16. Pueblo is nine miles north of Santa Clara, and La Mesa is six miles east of Santa Clara. What is the distance from Pueblo to La Mesa?

16. _____

17. What is the third value in the Pythagorean Triple that includes 15 and 17?

17. _____

18. The smaller squares have a side length of 7cm. What is the area of the larger dashed square in the diagram below?



18. _____

19. An isosceles triangle has congruent sides that are 6cm long, and a base that is 4cm long. What is its area?

19. _____

20. A ladder is 50 feet long and reaches a height of 48 feet. How high will the ladder reach if you pull the base of the ladder 16 feet farther from the wall?

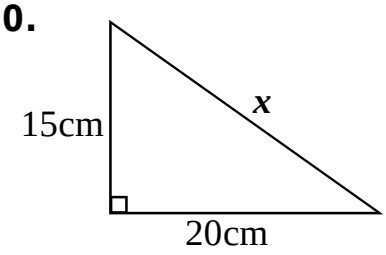
20. _____

Test Review

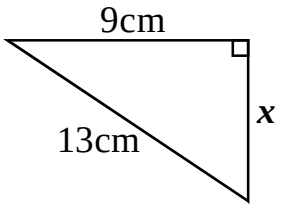
Math 8

Find each missing length:

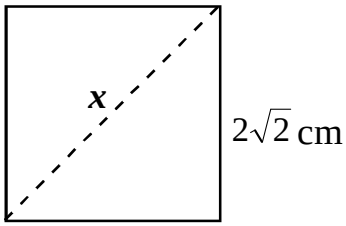
100.



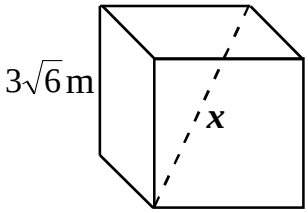
200.



300. (square)



400.



Solve each. Leave your answers in simplest radical form:

100. Fill-in the blank for the following Pythagorean triple: 36 ___ 85

200. What is the area of a rectangle that has a width of 8cm and a diagonal length of 10cm?

300. Find the distance between (-2, 3) and (5, -4).

400. What is the area of an equilateral triangle that has 14-inch sides?

Simplify Each:

100. $\sqrt{24} =$

200. $\sqrt{72} =$

300. $\sqrt{50} - \sqrt{32} =$

400. $\sqrt{\frac{12x^2}{5}} =$

Name_____ Period _____

Pythagorean Practice Test (4th)

Math 8

Simplify each:

1. $\sqrt{4{,}900} =$

1. _____

2. $\sqrt{12x^2}$

2. _____

3. $\sqrt{18} + \sqrt{8} =$

3. _____

4. $\sqrt{\frac{3}{25}} =$

4. _____

Solve each. Leave answers in radical form unless noted otherwise.

5. What is the altitude (height) of an isosceles triangle with congruent 10-inch sides and a 4-inch base (in simplest radical form)?

5. _____

6. Trey rides his bicycle from home 5 miles north to the store, 7 miles west to visit his friend, and then 1 mile south to the movie theater. How far does Trey live from the movie theater? Round to the tenth of a mile.

6. _____

7. A 25-foot ladder is placed 15 feet from a wall. How high will the top of the ladder reach?

7. _____

8. What is the distance between the following points? (1, -4) (-3, -1)

8. _____

9. ***How many*** of the following are Pythagorean Triples?

33-44-55 8-15-17 9-40-41 11-59-60 9-13-16

9. _____

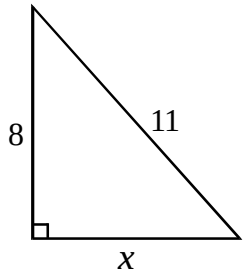
Name_____ Period _____

Pythagorean Practice Test (4th)

Math 8 11.4

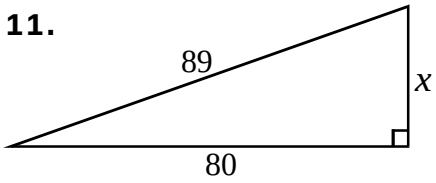
Find the missing length x for each diagram below. Leave all irrational answers in radical form.

10.



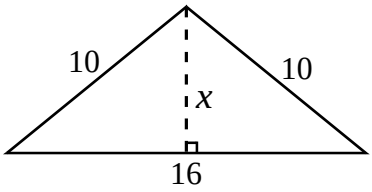
10. x=_____

11.



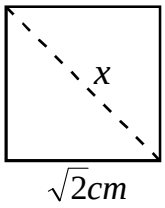
11. x=_____

12.



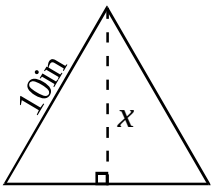
12. x=_____

13.



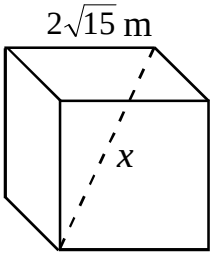
13. x=_____

14.



14. x=_____

15.



15. x=_____