

Zero The Math Hero

Standard Mathematical Elements - Lesson 8

Lesson 8 discusses 4 important theorems:

- The Pythagorean Theorem
- The Converse of the Pythagorean Theorem
- The Isosceles Triangle Theorem
- The Converse of the Isosceles Triangle Theorem

Lesson 8 describes the Pythagorean Theorem and its relevance in the real world. The historical background is also discussed. Several example problems are illustrated. Also, problems using algebraic skills are linked with geometric concepts.

Zero the Math Hero – Lesson 8

Lesson 8 – Definitions

hypotenuse - the longest side of a right triangle

legs - for a right triangle, the two sides that form the right angle

Pythagorean Triples - positive whole numbers that make $a^2 + b^2 = c^2$ a true statement

Parts of an isosceles triangle:

$\angle A$ - vertex angle

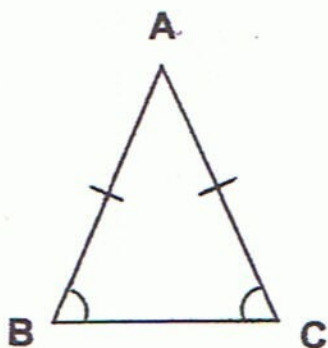
$\angle B$ - base angle

$\angle C$ - base angle

\overline{AB} - leg

\overline{AC} - leg

\overline{BC} - base



Lesson 8 – Theorems

Theorem 5 (The Pythagorean Theorem) - For a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

Theorem 6 (The Converse of the Pythagorean Theorem) - If the square of the length of one side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

Theorem 7 (The Isosceles Triangle Theorem) - If two sides of a triangle are congruent, then the angles opposite those two sides are also congruent.

Theorem 8 (The Converse of the Isosceles Triangle Theorem) - If two angles of a triangle are congruent, then the sides opposite those angles are also congruent.

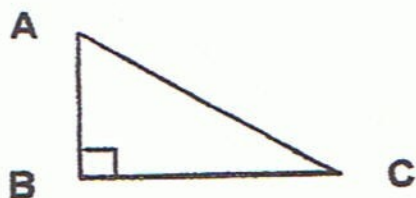
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Lesson 8 - Practice Problems

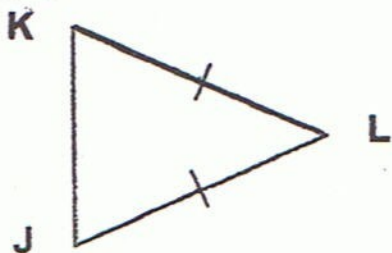
Pythagorean Theorem - Isosceles Triangles

1. Name the hypotenuse.



1. _____

2. Name the legs for this isosceles triangle.



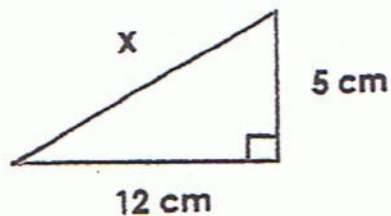
2. _____

3. True or false: The Pythagorean Theorem can be used to find the missing side for any triangle.

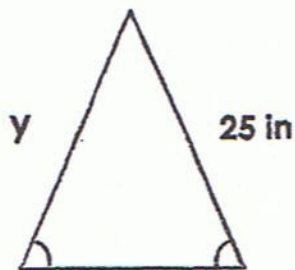
3. _____

A. True B. False

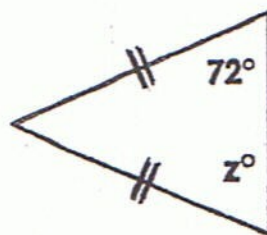
4. Find x.



5. Find y.



6. Find z.



x = _____

y = _____

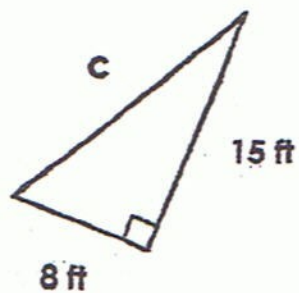
z = _____

Name: _____

Date: _____

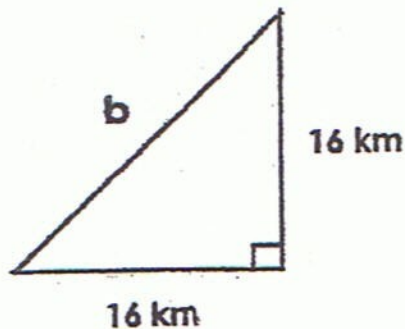
Lesson 8 - Practice Problems - Continued
Pythagorean Theorem - Isosceles Triangles

7. Find c .



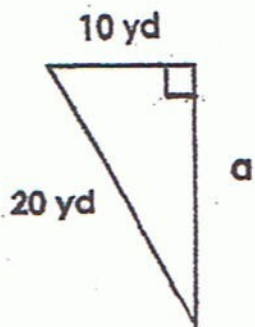
$c =$ _____

8. Find b .



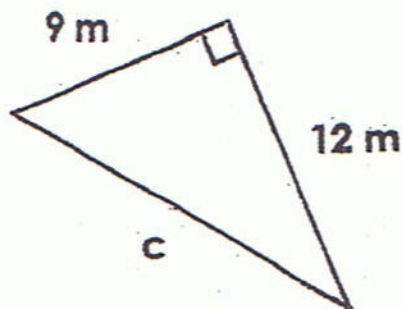
$b =$ _____

9. Find a .



$a =$ _____

10. Find c .



$c =$ _____

Name: _____

Date: _____

Quiz - Terms and Theorems

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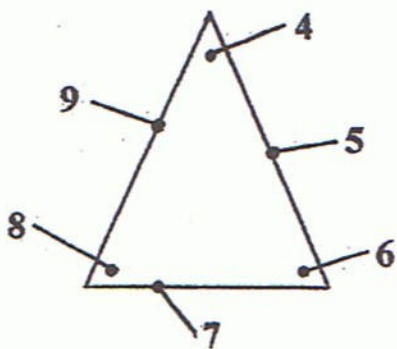
Lesson 8 – Terms

Directions: Fill in each blank with the letter that corresponds to the correct answer, A-K.

- _____ for a right triangle, the two sides that form the right angle
A. legs
- _____ the longest side of a right triangle
B. Pythagorean Triples
- _____ positive whole numbers that make $a^2 + b^2 = c^2$ a true statement
C. hypotenuse

Use the illustration below to identify the parts of an isosceles triangle listed as D-G. Some answers will be used more than once.

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____



- D. base angle
- E. leg
- F. base
- G. vertex angle

Lesson 8 – Theorems

Directions: Each theorem is missing parts, indicated by “(?)”. Use the letter choices beneath each theorem to indicate the correct missing words.

The Pythagorean Theorem

- _____ For a right triangle, the sum of the (?) of the lengths of the legs is equal to the square of the length of the (?).
H. squares, hypotenuse I. true, base
J. measures, hypotenuse K. angles, two sides

Name: _____

Date: _____

Quiz - Terms and Theorems - Continued

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The Converse of the Pythagorean Theorem

11. _____ If the square of the (?) of one side of a triangle is equal to the sum of the squares of the lengths of the other two (?), then the triangle is a right triangle.
- L. base, sides M. length, sides
N. angles, interior angles O. hypotenuse, right angles

The Isosceles Triangle Theorem

12. _____ If two sides of a triangle are (?), then the angles opposite those two (?) are also congruent.
- P. perpendicular, sides Q. unequal, angles
R. congruent, sides S. similar, angles

The Converse of the Isosceles Triangle Theorem

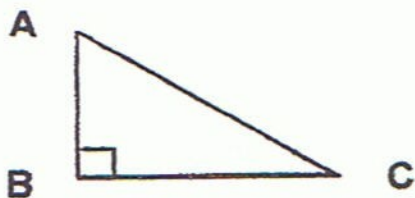
13. _____ If two angles of a triangle are congruent, then the sides (?) those angles are also (?).
- T. opposite, congruent U. connecting, perpendicular
V. forming, adjacent W. opposite, adjacent

Name: ANSWER KEY

Date: _____

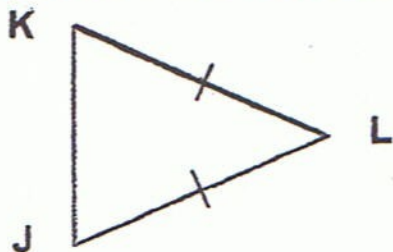
Lesson 8 - Practice Problems
Pythagorean Theorem - Isosceles Triangles

1. Name the hypotenuse.



1. \overline{AC} (or \overline{CA})
(or segment AC
or segment CA)

2. Name the legs for this isosceles triangle.



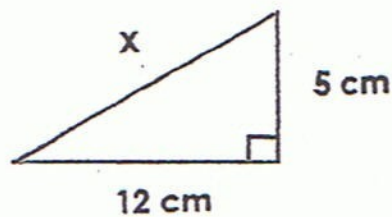
2. \overline{KL} and \overline{JL}
(or segment LK
and segment LJ)

3. True or false: The Pythagorean Theorem can be used to find the missing side for any triangle.

3. B (false)

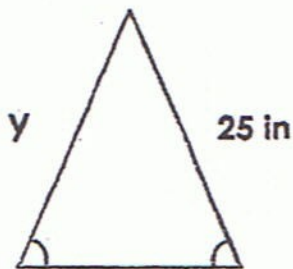
A. True B. False

4. Find x.



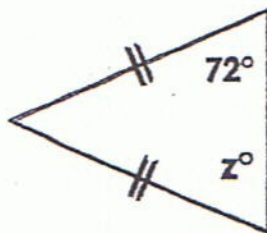
x = 13 cm

5. Find y.



y = 25 in

6. Find z.



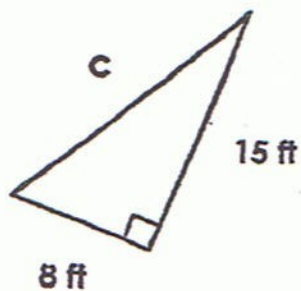
z = 72 degrees

Name: ANSWER KEY

Date: _____

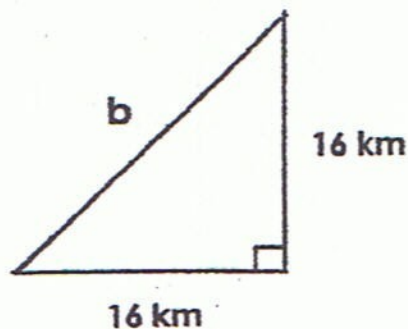
Lesson 8 - Practice Problems - Continued
Pythagorean Theorem - Isosceles Triangles

7. Find c.



$$c = \underline{17 \text{ ft}}$$

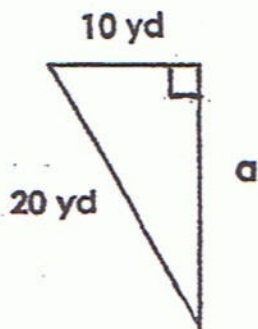
8. Find b.



$$b = \underline{16\sqrt{2} \text{ km}}$$

(or $\approx 22.6 \text{ km}$)

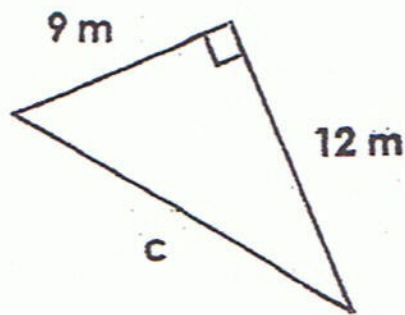
9. Find a.



$$a = \underline{10\sqrt{3} \text{ yd}}$$

(or $\approx 17.3 \text{ yd}$)

10. Find c.



$$c = \underline{15 \text{ m}}$$

Name: ANSWER KEY

Date: _____

Quiz - Terms and Theorems

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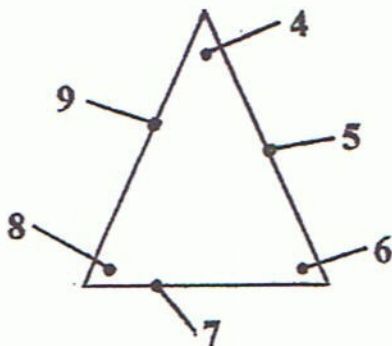
Lesson 8 - Terms

Directions: Fill in each blank with the letter that corresponds to the correct answer, A-C.

1. A for a right triangle, the two sides that form the right angle
A. legs
2. C the longest side of a right triangle
B. Pythagorean Triples
3. B positive whole numbers that make $a^2 + b^2 = c^2$ a true statement
C. hypotenuse

Use the illustration below to identify the parts of an isosceles triangle listed as D-G. Some answers will be used more than once.

4. G
5. E
6. D
7. F
8. D
9. E



- D. base angle
- E. leg
- F. base
- G. vertex angle

Lesson 8 - Theorems

Directions: Each theorem is missing parts, indicated by "(?)". Use the letter choices beneath each theorem to indicate the correct missing words.

The Pythagorean Theorem

10. H For a right triangle, the sum of the (?) of the lengths of the legs is equal to the square of the length of the (?).
H. squares, hypotenuse I. true, base
J. measures, hypotenuse K. angles, two sides

Name: ANSWER KEY

Date: _____

Quiz - Terms and Theorems - Continued

Zero the Math Hero - Lesson 8

The Converse of the Pythagorean Theorem

11. M If the square of the (?) of one side of a triangle is equal to the sum of the squares of the lengths of the other two (?), then the triangle is a right triangle.
- L. base, sides M. length, sides
N. angles, interior angles O. hypotenuse, right angles

The Isosceles Triangle Theorem

12. R If two sides of a triangle are (?), then the angles opposite those two (?) are also congruent.
- P. perpendicular, sides Q. unequal, angles
R. congruent, sides S. similar, angles

The Converse of the Isosceles Triangle Theorem

13. T If two angles of a triangle are congruent, then the sides (?) those angles are also (?).
- T. opposite, congruent U. connecting, perpendicular
V. forming, adjacent W. opposite, adjacent