


Grade 8 Mathematics

Geometry: Lesson 10

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol () by them.

Purpose of Lesson 10:

- In this lesson, the tutor and the students will
✓ use the Pythagorean theorem.

Equipment/Materials Needed:

- Copies of Student Sheets 108 and 109
- Paper and pencils
- Chalkboard
- Calculator

Preparations before beginning Lesson 10:

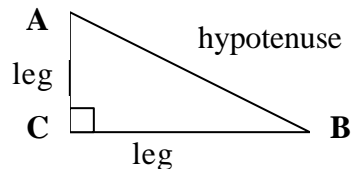
- Run one copy of Student Sheets 108 and 109 for each student.
- Have paper and pencils available.
- You should cover Lesson 5 in Algebra before beginning this lesson.
- Borrow calculators from one of the mathematics teachers.

Lesson 10: Geometry

Say:

What is a right triangle? (a triangle with a right angle) **Right triangles have special names for their sides.**

🕒 Draw this figure on the board.



Say:

The two sides of a right triangle are called the *legs*. The side opposite the right angle is called the *hypotenuse*. The hypotenuse will always be the longest side.

🕒 Give the students Student Sheet 108. It would be nice to allow them to use a calculator. The multiplication in here would be tedious. Have them fill in the rest of the table in Problem 4.

	a	b	c	a^2	b^2	$a^2 + b^2$	c^2
1.	3	4	5	9	16	25	25
2.	9	12	15	81	144	225	225
3.	8	6	10	64	36	100	100

Say:

The table in Problem 4, shows the lengths of a , b , and c in each triangle. What do you notice in the table? ($a^2 + b^2 = c^2$. c is always longer than a or b .)

Say:

Looking at the chart, you can see that the sum of the squares of the lengths of the legs, a and b , is equal to the square of the hypotenuse, or length c . This relationship is a special one that works only for right triangles. The relationship is called the *Pythagorean Theorem*. In symbols, this relationship is written as $a^2 + b^2 = c^2$ or $c^2 = a^2 + b^2$. Explain in words what the Pythagorean theorem says. (The sum of the squares of the legs of a right triangle equals the square of the length of the hypotenuse.)

Say:

This relationship can be very useful. If you have a right triangle and know the lengths of two of the sides, you can find the length of the third side.

Look at Problem 5 on Student Sheet 108. What are the lengths of a and b ? (9 in. and 40 in.) What is a^2 ? (81 sq. inches) What is b^2 ? (1600 sq. inches) What is $a^2 + b^2$? (81 sq. inches + 1600 sq. inches = 1681 sq. inches) What is c^2 ? (1681 sq. inches) What is the square root of c^2 ? (c) What is the square root of 1681 square inches? (41 inches) What is the length of c ? (41 inches)

Say:

Have students work Problem 6. The answer is 13 cm. Look at Problem 7. What are the lengths of a and b ? (25 mm and 16 mm) What is a^2 ? (625 sq. mm) What is b^2 ? (256 sq. mm) What is $a^2 + b^2$? (881 sq. mm) What is c^2 ? (881 sq. mm) What is c ? ($\sqrt{881}$ or about 29.7 mm)

Look at Problem 8. What do you need to find? (the length of b) What is the length of a ? (18 ft.) What is a^2 ? (324 sq. ft.) What is the length of c ? (25 ft.) What is c^2 ? (625 sq. ft.) How can you find the length of b ?

$$\text{Use } a^2 + b^2 = c^2.$$

$$324 + b^2 = 625.$$

$$b^2 = 625 - 324$$

$$b^2 = 301.$$

$$\text{If } b^2 = 301, \text{ then } b = 17.3.$$


Solve for b^2 .

The length of b is 17.3 ft.

 Give the students Student Sheet 109.

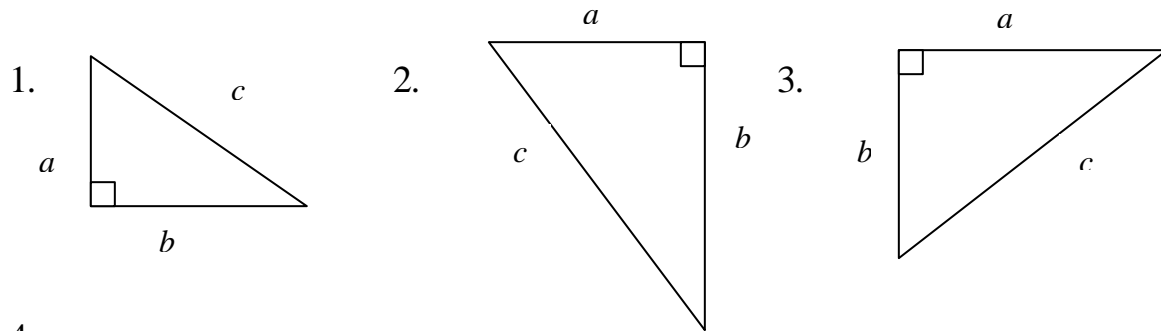
Answers:

1. about 86 feet or 85.9 feet
2. about 127 feet
3. about 7.4 meters
4. 25 meters

 Have one student summarize today's lesson. The Pythagorean Theorem allows you to find the missing lengths of a right triangle.

Student Sheet 108 (Geometry: Lesson 10)

The lengths of segments a , b , and c in triangles 1 – 3 are listed in the table in problem 4. Fill in the rest of the table.

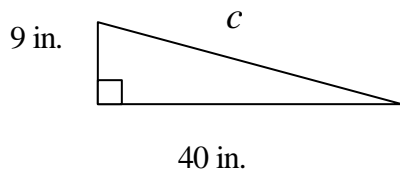


4.

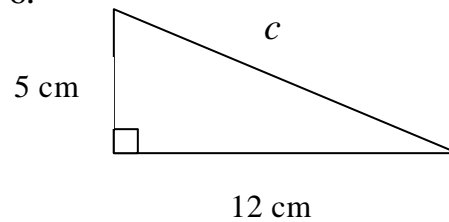
	a	b	c	a^2	b^2	$a^2 + b^2$	c^2
1.	3	4	5				
2.	9	12	15				
3.	8	6	10				

Find the length of the missing segment in each triangle. Round your answers to the nearest tenth.

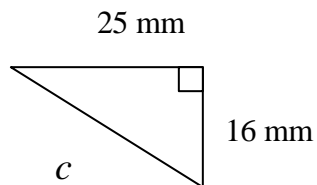
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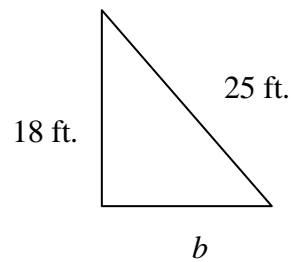
6.



7.

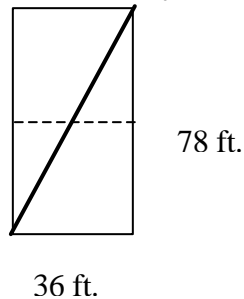


8.

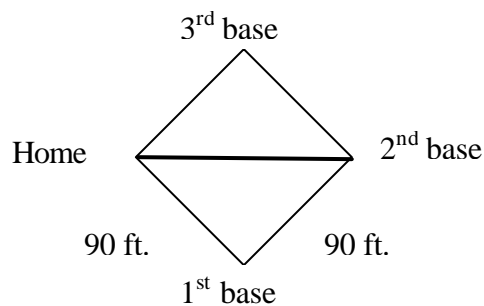


Student Sheet 109 (Geometry: Lesson 10)

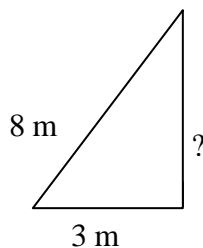
1. A tennis court measures 36 feet by 78 feet. What is the approximate crosscourt distance?



2. A baseball diamond measures 90 ft. by 90 ft. If the catcher throws from home plate to 2nd base, about how far is the throw?



3. An eight meter ladder leans against a building. The base of the ladder is three meters from the base of the building. About how far up the building does the ladder touch the building?



4. A 20 m pole will be braced by a wire extending from the top of the pole to a stake driven into the ground 15 m away from the base of the pole. What is the length of the extended wire? Drawing a picture may help you solve the problem.