Pythagoras' Theorem Teacher's Notes

Subject: Mathematics

Topic: Pythagoras' theorem

Level: Pre-intermediate, intermediate

Time needed: each worksheet will take approximately 1 hour to complete

Learning objectives:

- to understand the relationship between the sides of right angled-triangle
- to solve problems using Pythagoras' Theorem
- to define mathematical terms orally and in writing
- to read and summarize a text passage in a group

Key skills:

- reading comprehension
- knowledge of several mathematical terms
- comprehension of Pythagoras' Theorem
- cooperative skills for group work

Key vocabulary:

triangle, square, root, hypotenuse, leg, angle, side, length, equation

Key language:

If the triangle has a right angle and you made a square on each of the three sides, then the biggest square has the exact same area as the other two squares put together.

Materials:

- worksheets 1 and 2
- a picture of Pythagoras (to be found on the internet)
- sheet with various shapes to cut-out

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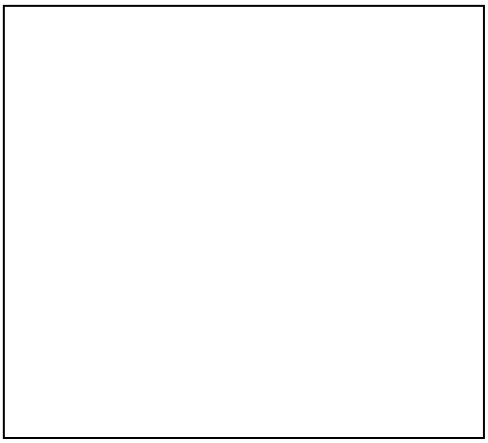

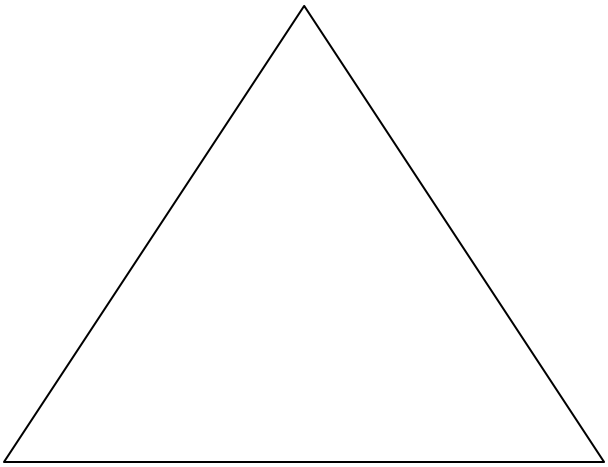

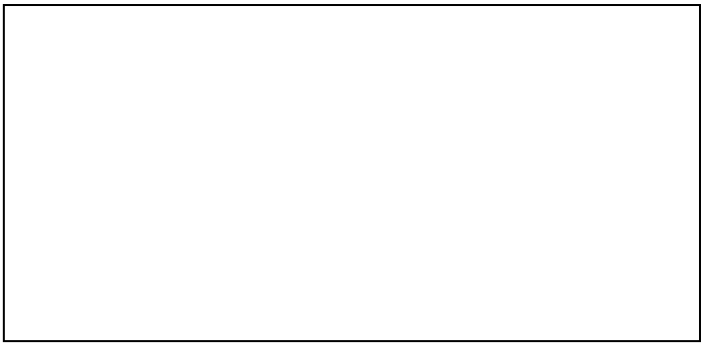

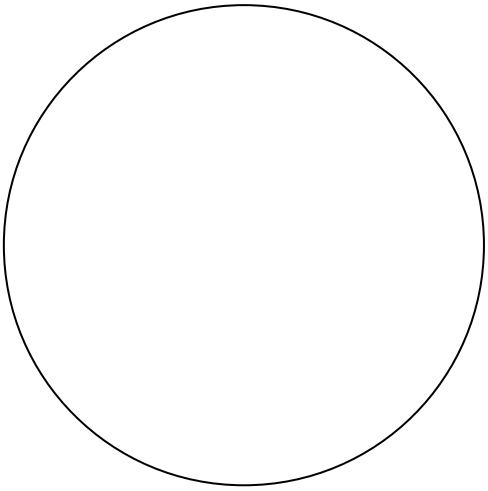

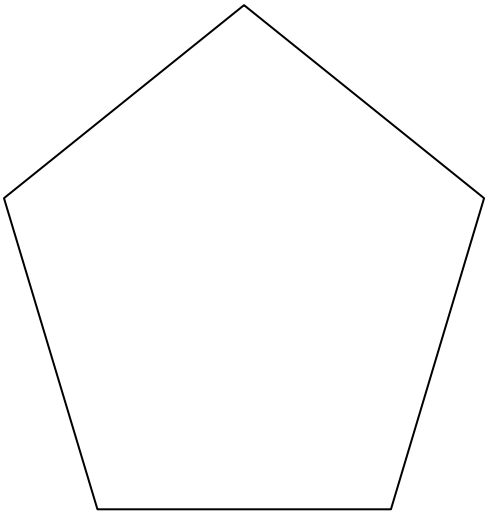

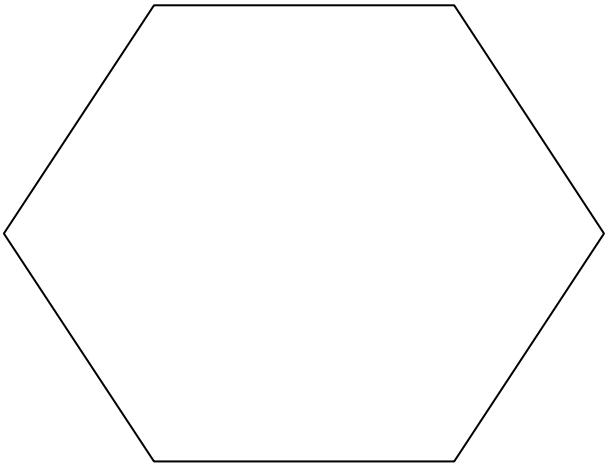

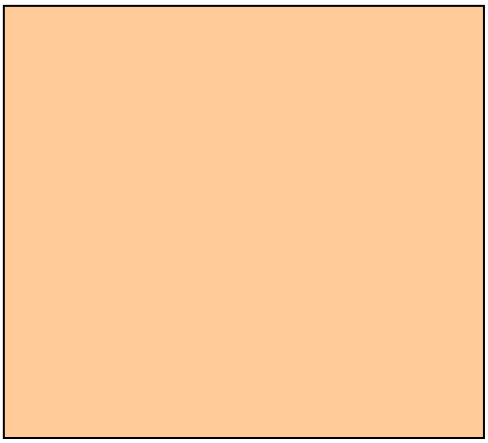

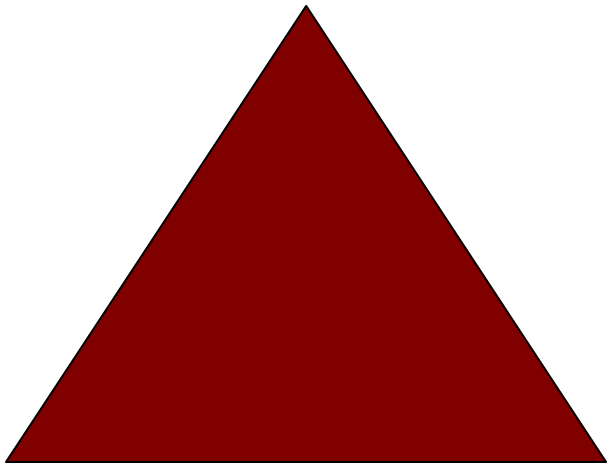

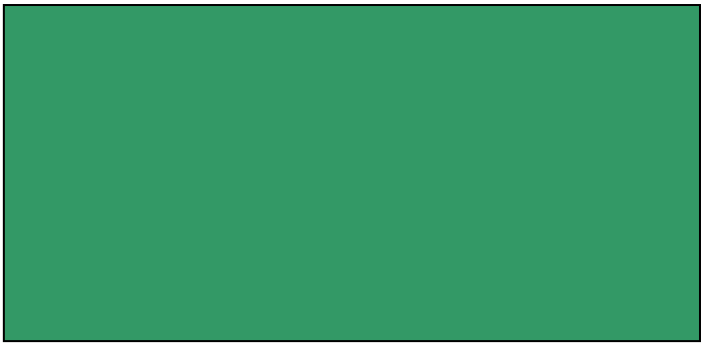

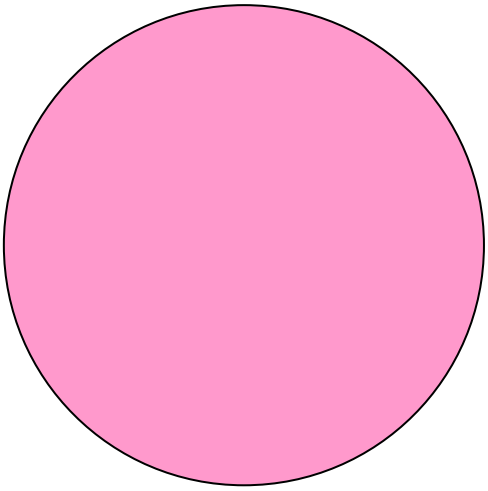

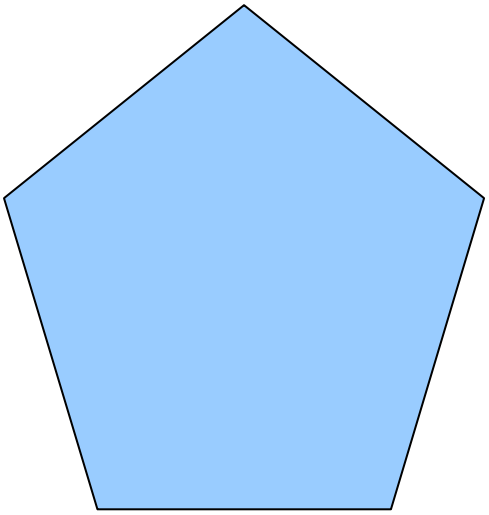

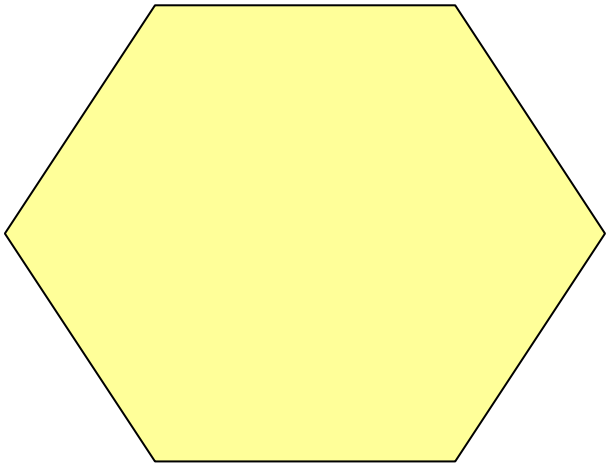

Worksheet 1 – introductory activities

Activity 1: Match the shapes with their names.

Learners match the shapes with their names. You can paste the shapes on the board (or simply draw) and write their names next to them.

Activity 2: Complete the crossword. What is the vertical word?

If possible, translate the words into students' mother tongue or write explanations in English.

1.		R	I	G	H	T				
2.	L	E	N	G	T	H				
3.	S	Q	U	A	R	E				
4.				R	O	O	T			
5.					T	R	I	A	N	G	L	E
6.			S	I	D	E	S			
7.			F	O	R	M	U	L	A	

Activity 3: Piece the puzzle of Pythagoras together. Use the pieces your teacher will give you.

Find a picture of Pythagoras (on the internet or in an encyclopedia) and cut it into pieces. Divide students into groups. Use various shapes for grouping (each student get a piece of paper in particular shape (eg, if you have 16 learners, make four groups of 4, so that you cut out 4 squares, 4 triangles, 4 circles and 4 rectangles). Revise the names of the shapes again. Learners put the puzzle together to create a complete picture of Pythagoras.

Activity 4: Read this text about Pythagoras. Then answer the questions.

Reading comprehension - each group gets the text about Pythagoras. Their task is to answer the questions under the text. You can then discuss them.

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Activity 5: Label this diagram of a right-angled triangle. Use the words in the box.

Learners label the diagram with the words in the box.

Answers:

1. side a
2. leg (a)
3. angle
4. length
5. leg (b)
6. hypotenuse (c)

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Activity 6: Rewrite the sentences using the zero-conditional.

Explain the use of the zero conditional. When we talk about things that are generally or always true, we can use:

IF	Condition	result
	present simple	**present simple**
If	we heat water to 100 degrees	it boils.

Answers:

1. Iron rusts if it gets wet.
2. If there is no rain, the grass doesn't grow.
3. If you don't eat, you die.
4. If my daughter eats too much chocolate, she gets sick.
5. If you drop ice in water, it floats.

Worksheet 2

Activity 1: Listen to the talk and make notes on Pythagoras' Theorem.

Learners watch, listen and make notes. Show the pictures/diagrams below or draw on the board. Lecture script as follows:

Many years ago, a brilliant man called Pythagoras found out some amazing facts about right-angled triangles. He discovered that if the triangle has a right angle (that is 90°) and you made a square on each of the three sides, then the biggest square had the **exact same area** as the other two squares put together. [Write this sentence on the board and point out the use of the zero conditional.]

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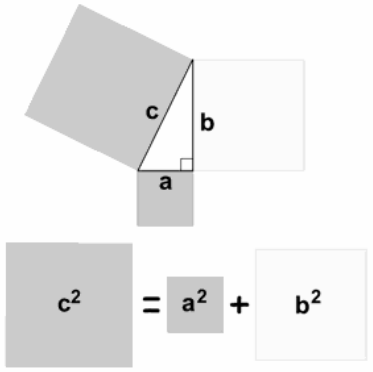
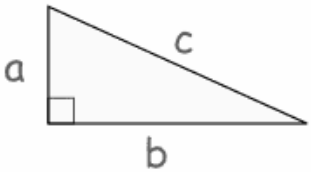


The longest side of the triangle is called the **hypotenuse**, so the formal definition is:

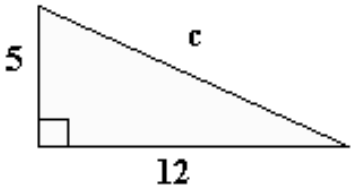
> In a right angled triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

So, the square of a (a^2) plus the square of b (b^2) is equal to the square of c (c^2):

$a^2 + b^2 = c^2$



Example:



$a^2 + b^2 = c^2$

$5^2 + 12^2 = c^2$

$25 + 144 = 169$

$c^2 = 169$ → $c = \sqrt{169}$ → **c = 13**

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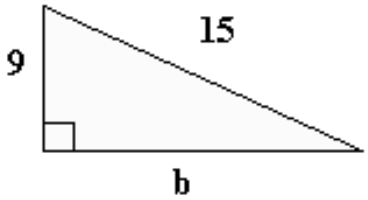
$a^2 + b^2 = c^2$

$9^2 + b^2 = 15^2$

$81 + b^2 = 225$



Take 81 from both sides

$b^2 = 144$ → b = √144 → **b = 12**

Activity 2: Solve these problems.

Learners work individually and solve mathematical problems by using Pythagoras' Theorem.

Answers:

a) 12

b) The ladder will reach 10.2 metres up the wall.

c) 8

Activity 3: Read the words. Pay attention to the correct pronunciation.

Let your learners pronounce the words, then focus on any words they mispronounce. Drill the correct pronunciation using the phonetic transcription.

Activity 4: Complete the crossword.

NB: you can create your own crossword with the help of http://www.eclipsecrossword.com/.

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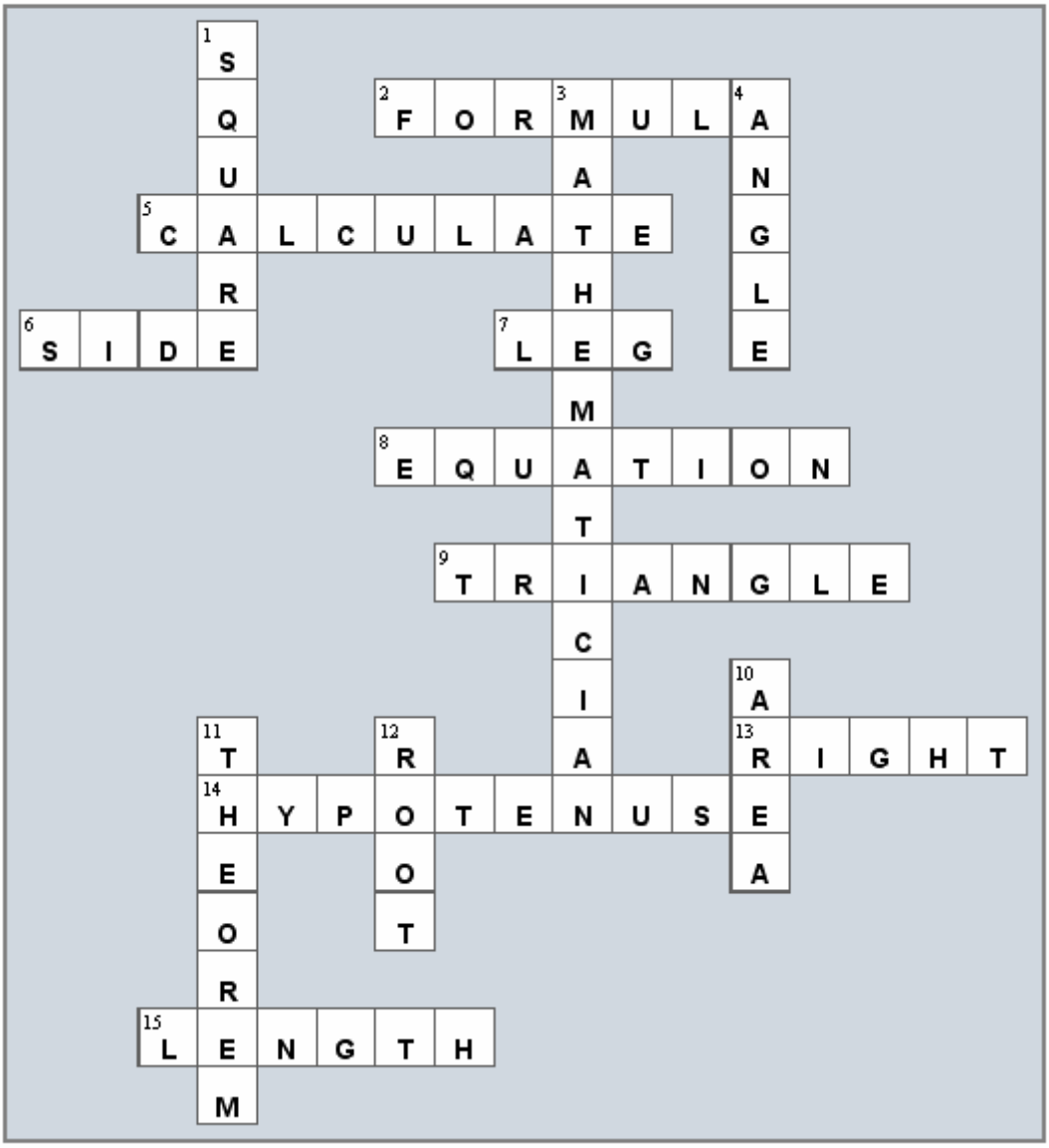
Pythagorean Theorem



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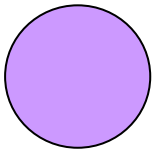
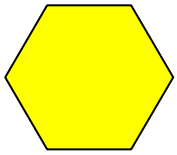
Pythagoras' Theorem

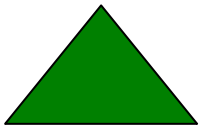
Worksheet 1

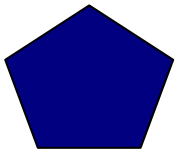
Activity 1: Match the shapes with their names.

square	triangle	rectangle	circle	pentagon	hexagon









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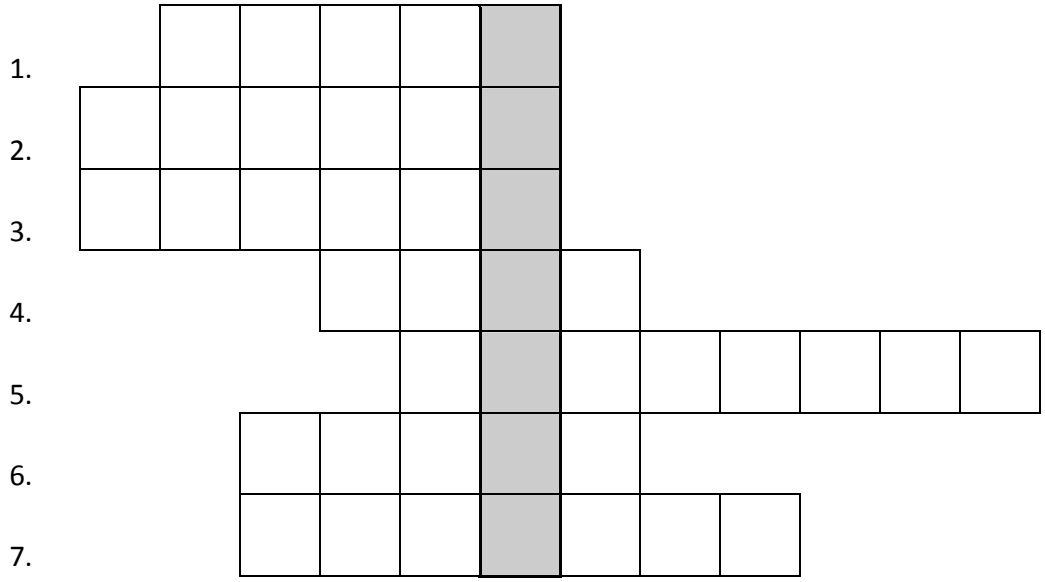
Activity 2: Complete the crossword. What is the vertical word?



1. an angle of 90° is a _____ angle
2. the measurement of how long something is
3. like a rectangle, but the sides are equal
4. the square _____ of 16 is 4 (symbol for this word: √)
5. a shape with three straight sides and three angles (symbol: Δ)
6. a triangle has three angles and three _____
7. the _____ for the perimeter of a triangle is p = a + b +c

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Activity 3: Piece the puzzle of Pythagoras together. Use the pieces your teacher will give you.

Activity 4: Read this text about Pythagoras. Then answer the questions.

Pythagoras

Pythagoras lived in the 500s BC, and was one of the first Greek mathematical thinkers. He spent most of his life in the Greek colonies in Sicily and southern Italy. He had a group of followers who followed him around and taught other people what he had taught them. The Pythagoreans were known for their pure lives (they didn't eat beans, for example, because they thought beans were not pure enough). They wore their hair long, and wore only simple clothing, and went barefoot. Both men and women were Pythagoreans.

Pythagoreans were interested in philosophy, but especially in music and mathematics, two ways of making order out of chaos. Music is noise that makes sense, and mathematics is a set of rules for how the world works.

Pythagoras himself is best known for proving that Pythagorean Theorem was true. The Sumerians, two thousand years earlier, already knew that it was generally true, and they used it in their measurements, but Pythagoras is said to have proved that it would always be true. We don't really know whether it was Pythagoras that proved it, because there is no evidence for it until the time of Euclid, but that is the tradition. While we call it Pythagorean Theorem, it was also known by Indian, Greek, Chinese and Babylonian mathematicians well before he lived.

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a) What do you know about Pythagoras?

_____

_____

_____

b) Who were Pythagoreans? What were they interested in?

_____

_____

_____

c) What did a Pythagorean look like? (Were they men or women? What did they wear?)

_____

_____

_____

d) What do mathematics and music have in common?

_____

_____

_____

e) Who proved Pythagorean Theorem?

_____

_____

_____

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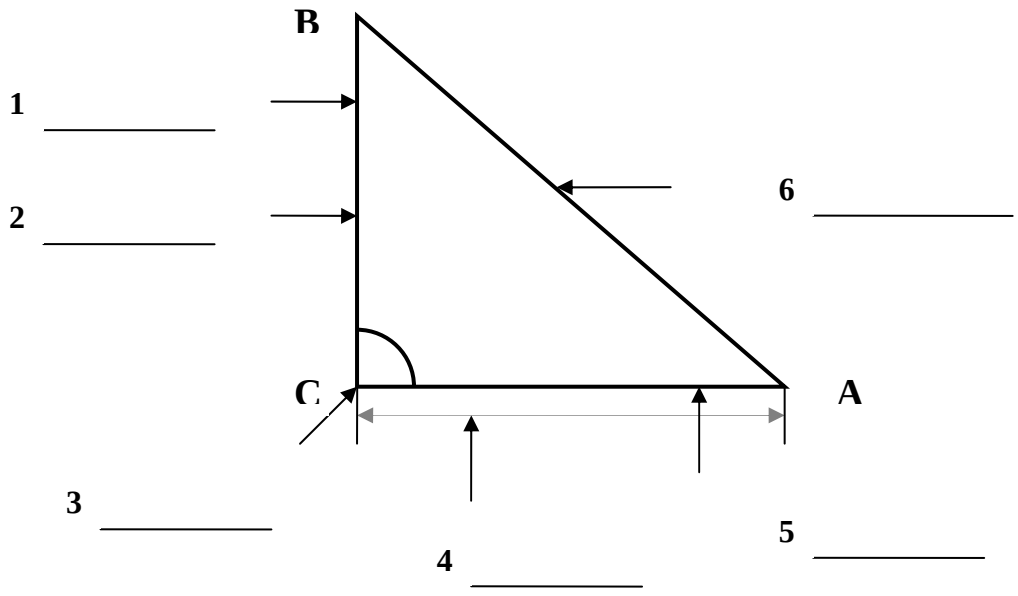
Activity 5: Label this diagram of a right-angled triangle. Use the words in the box.

side	angle	leg (a)	leg (b)	hypotenuse	length



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Activity 6: Rewrite the sentences using the zero-conditional.

Example:

water / boil / heat / to 100 degrees ► Water boils if you heat it to 100 degrees.

1 iron / rust / it / get / wet

_____

2 if / no / rain / the grass / not / grow

_____

3 you / not / eat / you / die

_____

4 my daughter / eat / too much chocolate / she / get / sick

_____

5 ice / float / you / drop / it / in water

_____

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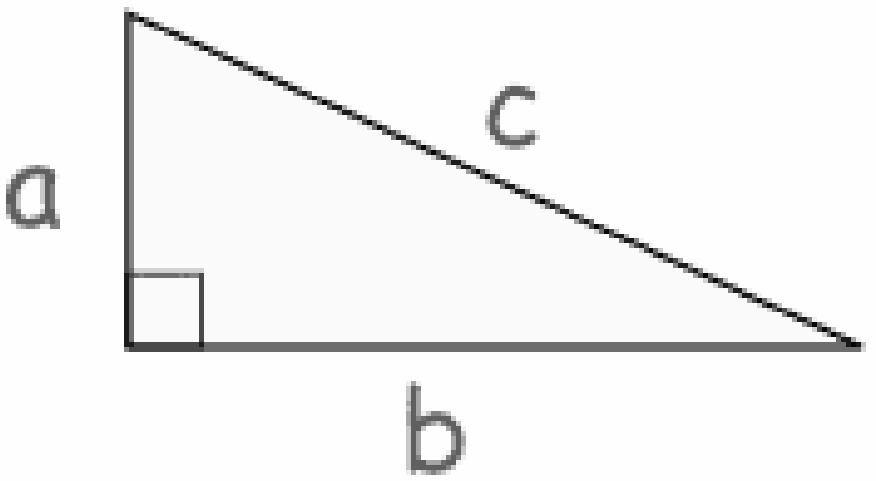
Pythagoras' Theorem Worksheet 2

Activity 1: Listen to the talk and make notes on Pythagoras' Theorem.



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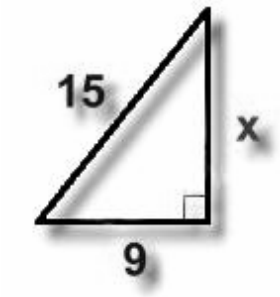
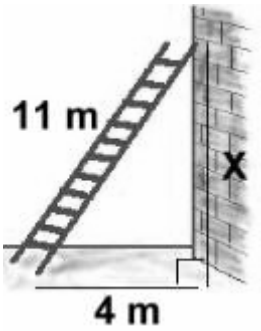
Activity 2: Solve these problems.

a) Find x.

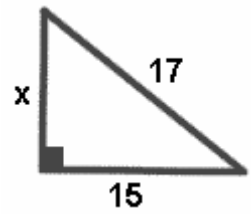


b) How far up a wall will an 11m ladder reach, if the foot of the ladder must be 4m from the base of the wall?



c) You know that a right triangle has a hypotenuse of 13 and a leg of 5. Find the other leg of the triangle without using paper and pencil.

d) Find x.



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Activity 3: Read the words. Pay attention to the correct pronunciation.

triangle

square

hypotenuse

angle

right-angled

right-angled triangle

opposite

mathematician

theorem

Pythagoras

Pythagorean Theorem

length

side

root

formula

equation

$a^2 + b^2 = c^2$

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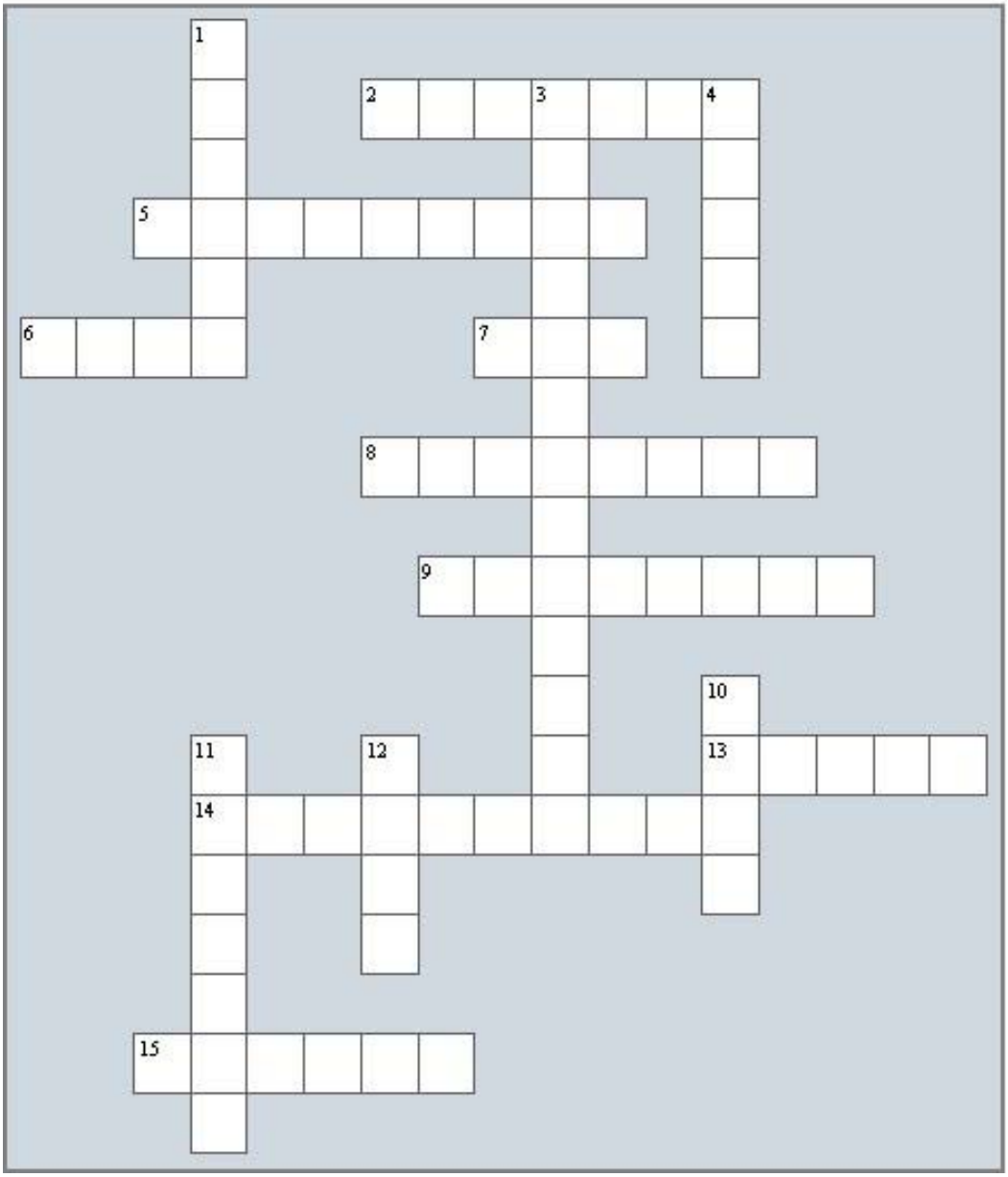
Activity 4: Complete the crossword.

Pythagorean Theorem



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Across

2. the _____ for calculating the area of a rectangle is Area = Length x Width

5. to find out how much something will cost, how long something will take etc. by using numbers

6. a triangle has three angles and three _____ s

7. one of the sides in a right-angled triangle is called a _____

8. in the _____ 2x + 1 = 7, what is x?

9. the symbol for this word is Δ

13. an angle of 90° is a _____ angle

14. the longest side in a right-angled triangle is called a _____

15. the measurement of how long something is

Down

1. it looks like a rectangle, but the sides are equally long

3. Pythagoras was a Greek _____

4. $\angle \beta = 60°$ - what does the symbol $\angle$ means?

10. the formula for calculating the _____ of a square is A = Length x Length

11. $a^2 + b^2 = c^2$ is the formula for Pythagorean _____

12. the square _____ of 25 is 5 ($\sqrt{25} = 5$)

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