School of Science and Technology, Singapore
Mathematics Department

Secondary 2 – Pythagoras' Theorem
Notes

Name _____ (   ) Class _____

Unit EU
Students will be able to understand that:
1. Similar triangles are **proportional** and share common ratios of the corresponding sides.
2. The Pythagoras' Theorem is an important property of a right-angled triangle with many useful applications.

Unit EQ
1. How can the common ratios of corresponding sides in similar triangles be applied in real world situations?
2. What are some of the properties of a right angled triangle?

Learning Objectives
At the end of the unit, students should be able to:
1. Solve problems using Pythagoras' Theorem.
2. Determine whether a triangle is a right-angled triangle given the lengths of three sides.

Reference Textbook
● Think! Mathematics New Syllabus Mathematics 8th Edition Textbook Secondary 2B. SL Education.

Lesson sequence in the unit								
Student Learning Outcomes	Dimensions (Please tick the appropriate boxes)							
	FUNCTIONS F	INVARIANCE I	NOTATIONS N	DIAGRAMS D	MEASURES M	EQUIVALENCE E	PROPORTIONALITY P	MODELS M
Pythagoras' Theorem			✓			✓	✓	
Trigonometric Ratios	✓				✓			

Unit Checklist

Cognitive Level	Know, Understand, Demonstrate	Checklist
Level 0: Memorisation	Explain what the Pythagorean Theorem is, as well as its converse.	
Level 1: Procedural tasks without connections	Apply the Pythagorean Theorem to find the lengths of a right-angle triangle.	
Level 2: Procedural tasks with connections	Apply the Pythagorean Theorem to solve simple geometrical problems.	
Level 3: Problem Solving	Apply the Pythagorean Theorem to solve simple real-life problems involving right-angle triangles.	

ACTIVITY 1 - The Right-angled Triangle

Generally, the side of a typical triangle is represented as the lower case of the vertex opposite it.
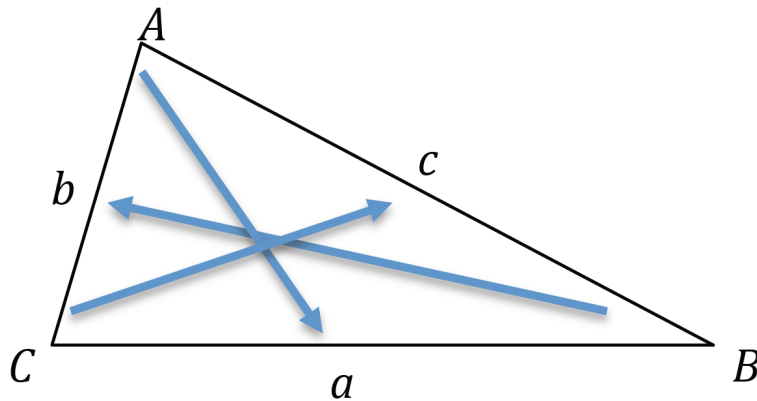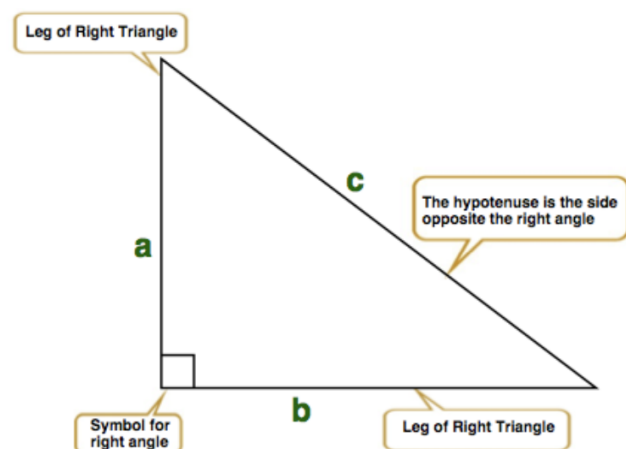
In a right-angled triangle, the longest side is known as the _____ .

The other two sides are known as the _____ of the right-angled triangle.

Big idea

This standardisation of NOTATIONS allows us to explain the Pythagoras' Theorem as well as other properties of a triangle such as the sine and cosine rules without cumbersome sentences.

Leg of Right Triangle

The hypotenuse is the side opposite the right angle

Symbol for right angle

Leg of Right Triangle

3

DISCUSSION 1 - The 12-knots Rope

In ancient Egypt, ropes with 12-knots on it are
commonly found. These knots are evenly spaced when
stretched out. What do you think these ropes were for?
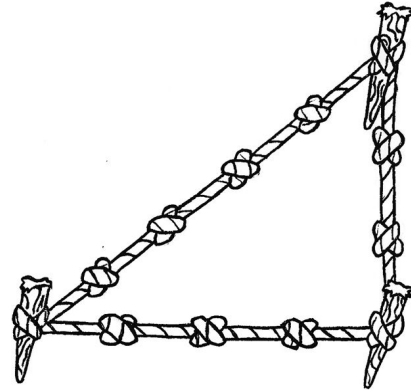
There are currently hundreds of proofs for the Pythagoras' Theorem published. Are you able to
describe one of them below?

PRACTICE 1 - Pythagoras' Theorem

(a) A TV antenna is 16 metres high. A supporting wire, W metres, is connected to the top 6 metres away from the base as in the diagram. Find the value of W.

W m

16 m

6 m
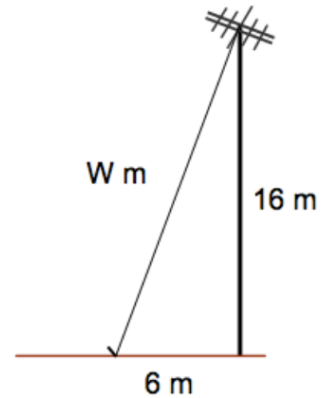
(b) The roof of a building has a base of 15 m in length. The truss is 8.5 m, and the height of the roof is x m as shown in the diagram. Find the value of x.

8.5 m

x m

15 m
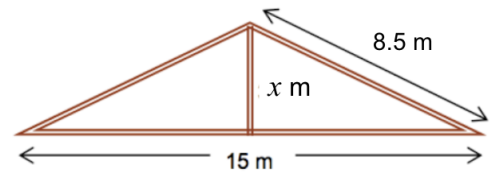
ACTIVITY and DISCUSSION 2 - Converse of Pythagoras' Theorem

Pythagoras' Theorem states that if an angle in a triangle is a right angle, then the square of the length of the side opposite the right angle is equal to the sum of the squares of the lengths of the other two sides.

The converse of Pythagoras' Theorem is also true.

- What does it mean by "converse"?
- Are the converses of all geometrical theorems true?

Big idea

The converse of the Pythagoras' Theorem is also true because for all similar triangles, the corresponding sides are always PROPORTIONAL.

(All right-angled triangles are similar to an instance of triangle with Pythagorean Triplets as the lengths of its sides.)

PRACTICE 2 - Converse of Pythagoras' Theorem

XYZ is a plot of land such that $XY = 45$ m, $YZ = 24$ m and $XZ = 51$ m.

(a) Show that angle $XYZ = 90°$.
(b) A tree T is located on ZY such that $ZT = 14$ m. Find TX, the distance of the tree from X.
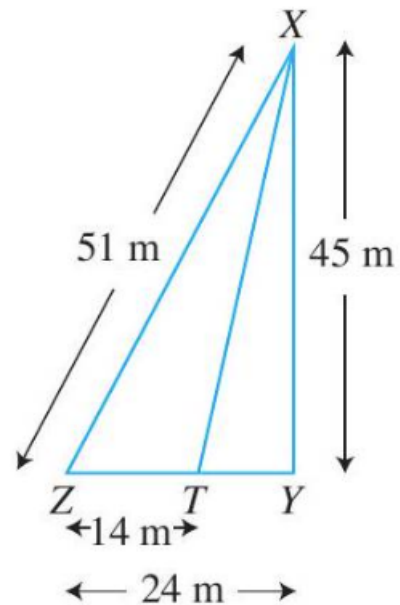
SUGGESTED PRACTICE QUESTIONS

Exercise 9A (page 43)

- **Questions 13, 14**

Exercise 9B (page 51)

- **Questions 6, 8, 10**

Exercise 9C (page 54)

- **Questions 3, 5**