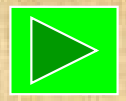
Pythagoras Theorem


Squaring a Number and Square Roots


Investigating Pythagoras Theorem


Calculating the Hypotenuse


Solving real-life problems


Finding the length of the smaller side


Distance between two points


Mixed problems

Squaring a Number

Learning Intention

1. To understand the term 'squaring a number'.

Success Criteria

1. To understand what is meant by the term 'squaring a number'
2. Be able to calculate squares both mentally and using the calculator.

Squaring a Number

To square a number means to :

"Multiply it by itself"

Example :

9^2 means $9 \times 9 = 81$

10^2 means $10 \times 10 = 100$

Square Root of a number

You now know how to find : $9^2 = 9 \times 9 = 81$

We can 'undo' this by asking

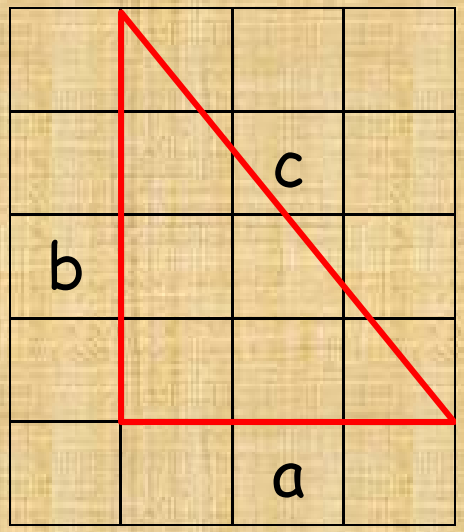
"which number, times itself, gives 81"

From the top line, the answer is 9

This is expressed as : "the SQUARE ROOT of 81 is 9"

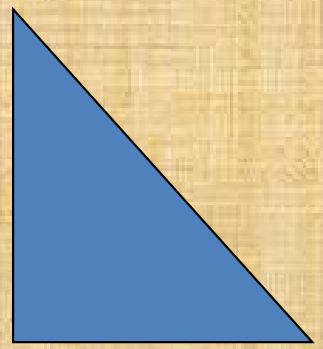
or in symbols we write : $\sqrt{81} = 9$

Right – Angle Triangles

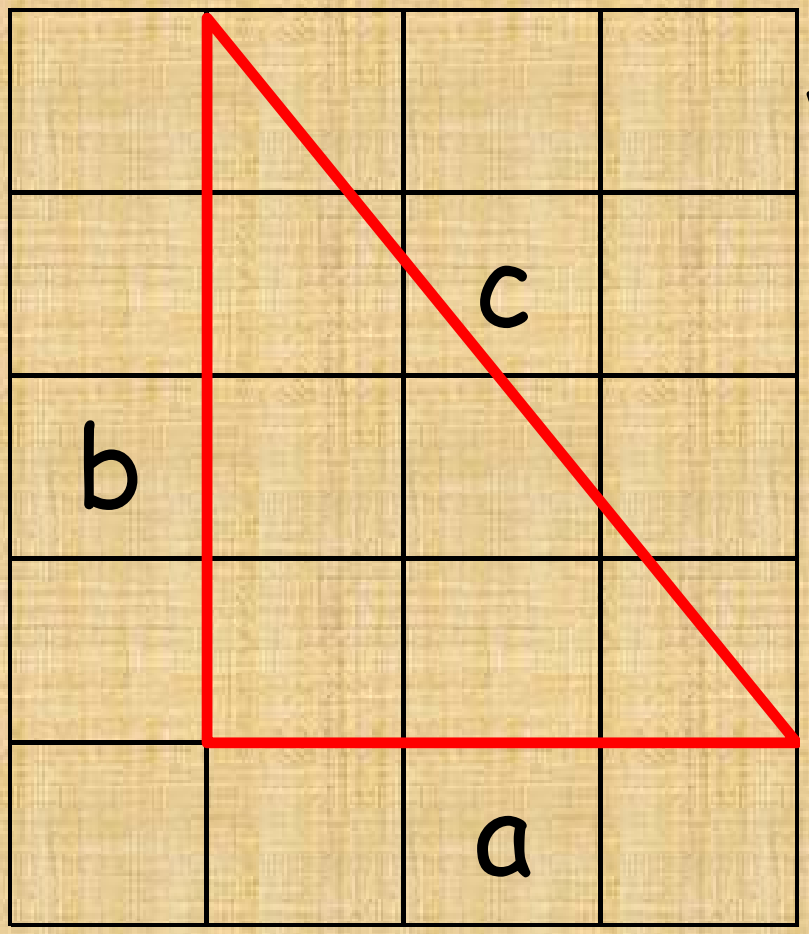


Aim of today's Lesson

'To investigate the right-angle triangle and to come up with a relationship between the lengths of its two shorter sides and the longest side which is called the hypotenuse.'



Right - Angle Triangles



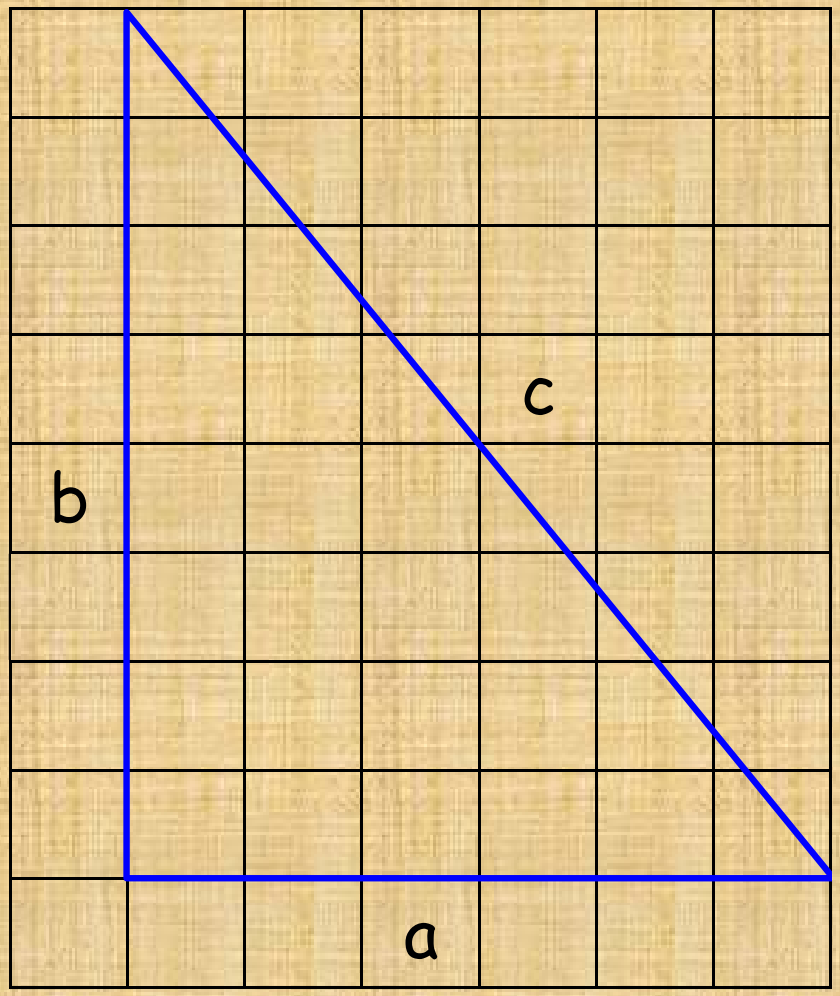
What is the length of **a** ? 3

What is the length of **b** ? 4

Copy the triangle into your jotter and measure the length of c

5

Right - Angle Triangles



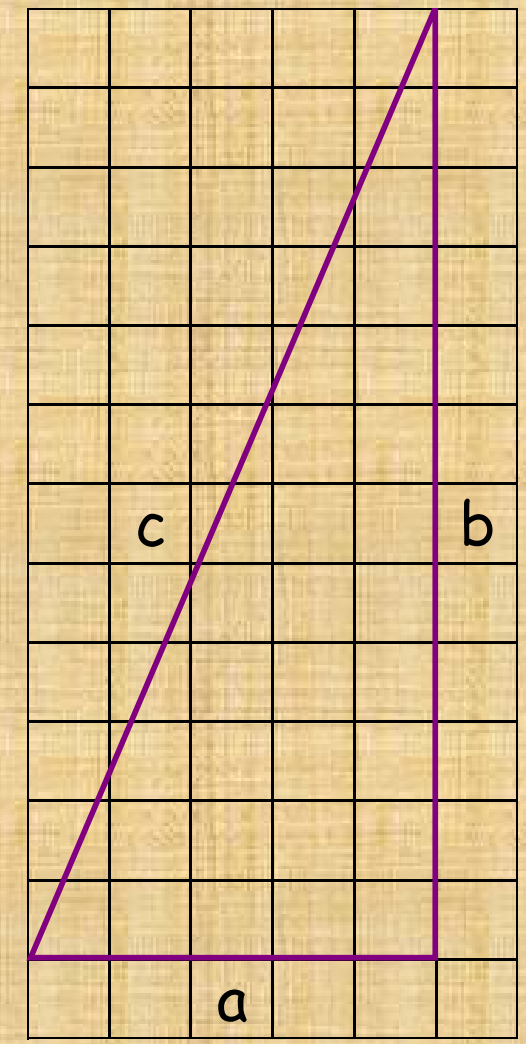
What is the length of **a** ? 6

What is the length of **b** ? 8

Copy the triangle into your jotter and measure the length of c

10

Right - Angle Triangles



What is the length of **a** ? 5

What is the length of **b** ? 12

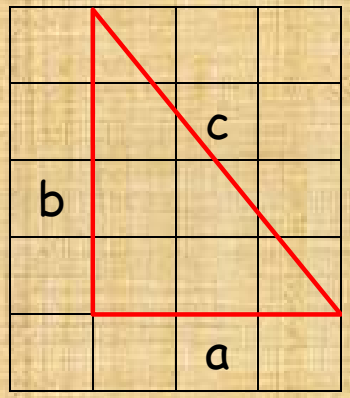
Copy the triangle into your jotter and measure the length of c

13

Right - Angle Triangles

Copy the table below and fill in the values that are missing

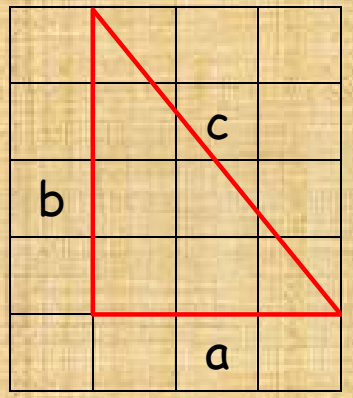
a	b	c	a^2	b^2	c^2
3	4	5			
5	12	13			
6	8	10			



Right - Angle Triangles

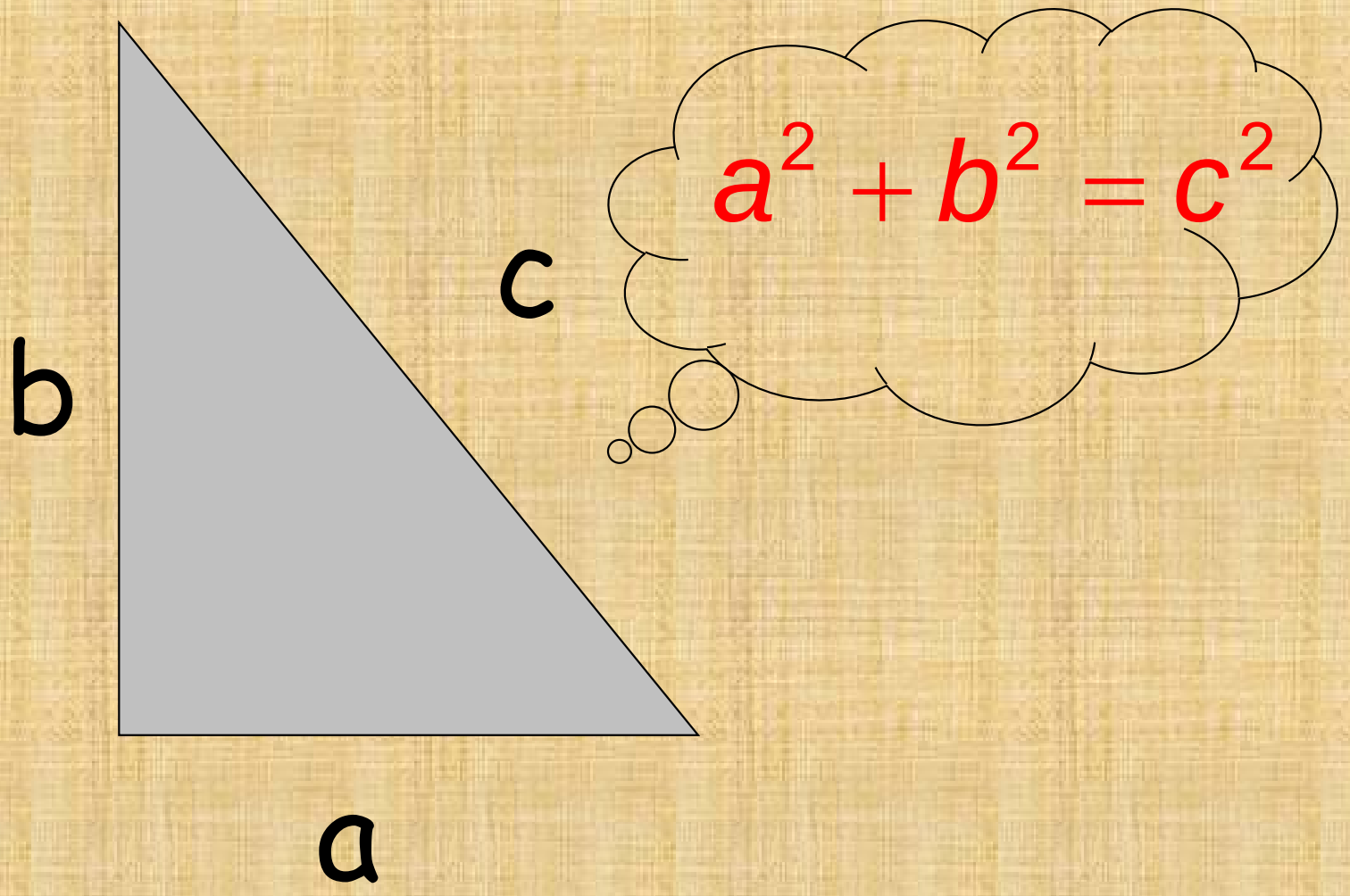
Can anyone spot a relationship between a^2, b^2, c^2.

a	b	c	a^2	b^2	c^2
3	4	5	9	16	25
5	12	13	25	144	169
6	8	10	36	64	100



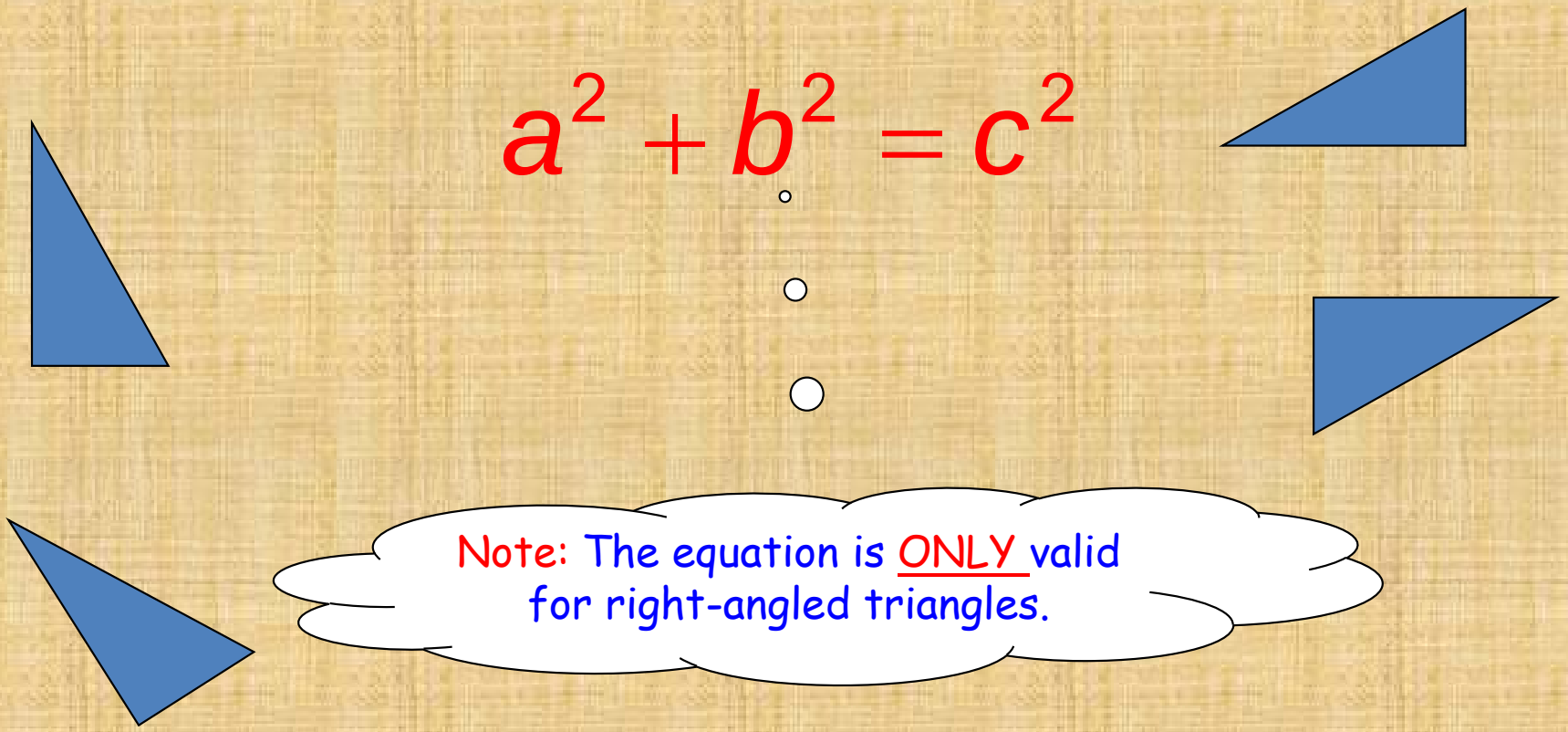
$$a^2 + b^2 = c^2$$

Pythagoras's Theorem



Summary of Pythagoras's Theorem

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



Note: The equation is ONLY valid for right-angled triangles.

Calculating Hypotenuse

Learning Intention

1. Use Pythagoras Theorem to calculate the length of the hypotenuse
   "the longest side"

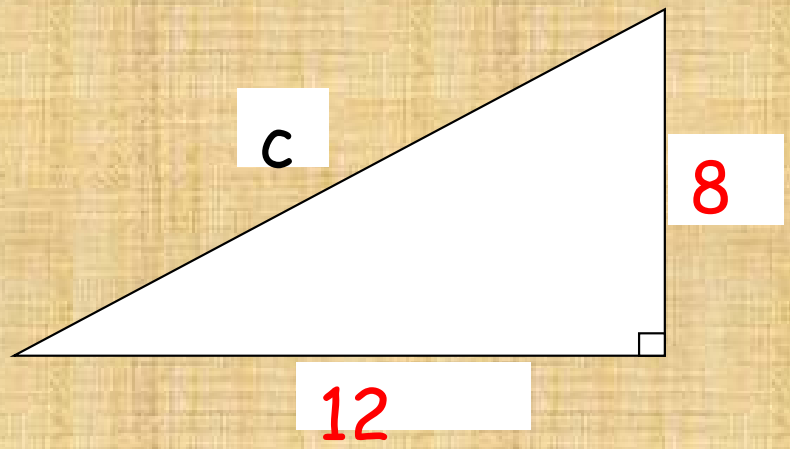
Success Criteria

1. Know the term hypotenuse
   " the longest side"
2. Use Pythagoras Theorem to calculate the hypotenuse.

Calculating the Hypotenuse

Example 1

Q2. Calculate the longest length of the right-angled triangle below.



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

$c^2 = 12^2 + 8^2$

$c^2 = 208$

$c = \sqrt{208} = 14.42\text{km}$

Calculating the Hypotenuse

Example 2

Q1. An aeroplane is preparing to land at Glasgow Airport. It is over Lennoxtown at present which is 15km from the airport. It is at a height of 8km.

How far away is the plane from the airport?

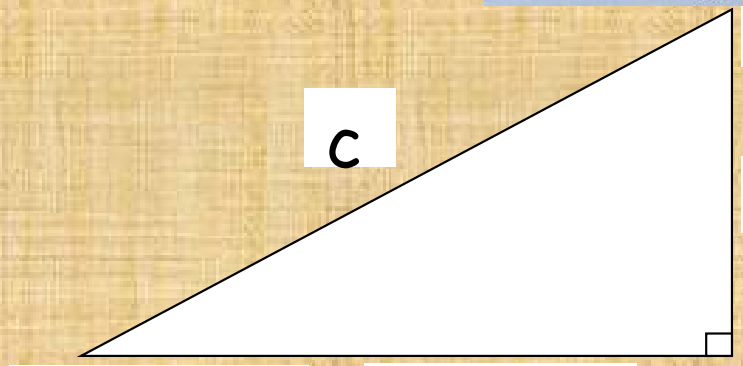
Aeroplane

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

$c^2 = 15^2 + 8^2$

$c^2 = 289$

$c = \sqrt{289} = 17\text{km}$



Solving Real-Life Problems

Learning Intention

1. To show how Pythagoras Theorem can be used to solve real-life problems.

Success Criteria

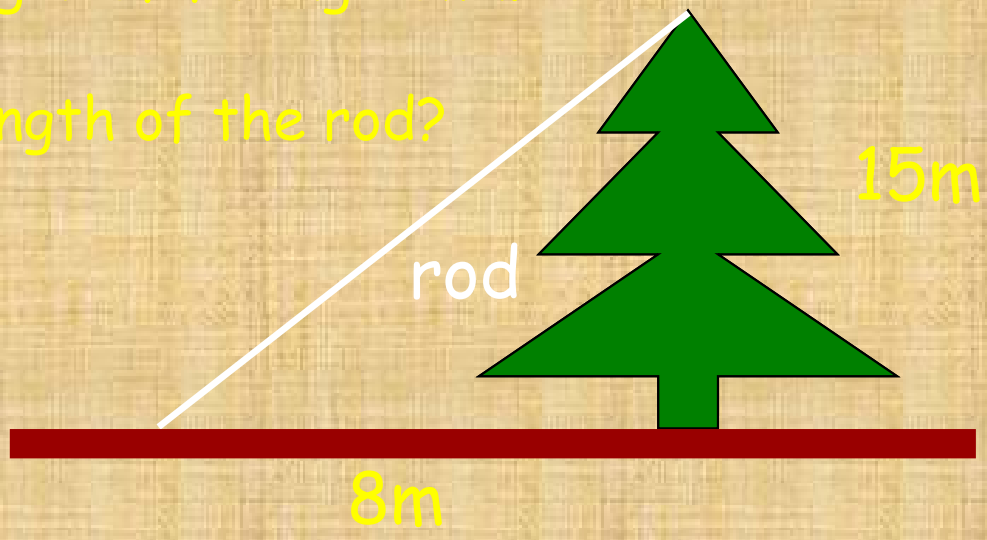
1. Solve real-life problems using Pythagoras Theorem.

Solving Real-Life Problems

When coming across a problem involving finding a missing side in a right-angled triangle, you should consider using Pythagoras' Theorem to calculate its length.

Example : A steel rod is used to support a tree which is in danger of falling down.

What is the length of the rod?



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

$$c^2 = 8^2 + 15^2$$

$$c^2 = 289$$

$$c = \sqrt{289} = 17\text{m}$$

Solving Real-Life Problems

Example 2

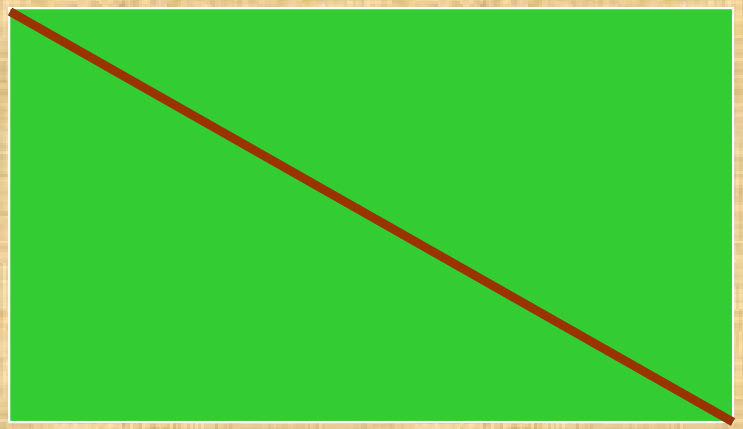
A garden is rectangular in shape. A fence is to be put along the diagonal as shown below. What is the length of the fence.

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

$c^2 = 10^2 + 15^2$

$c^2 = 325$

$c = \sqrt{325} = 18.03\text{m}$



Length of the smaller side

Learning Intention

1. To show how Pythagoras Theorem can be used to find the length of the smaller side.

Success Criteria

1. Use Pythagoras Theorem to find the length of smaller side.

Length of the smaller side

To find the length of the smaller side of a right- angled triangle we simply rearrange Pythagoras Theorem.

Example : Find the length of side a ?

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

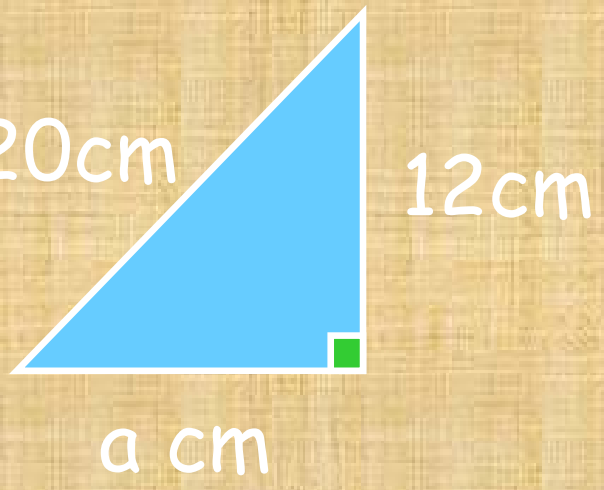
$a^2 = c^2 - b^2$

$a^2 = 20^2 - 12^2$

$a^2 = 256$

$a = \sqrt{256} = 16\text{cm}$

Check answer ! Always smaller than hypotenuse



Length of the smaller side

Example : Find the length of side b ?

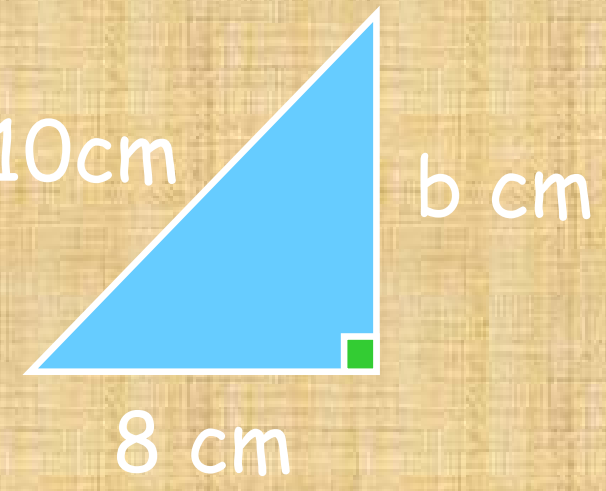
$c^2 = a^2 + b^2$

$b^2 = c^2 - a^2$

$b^2 = 10^2 - 8^2$

$b^2 = 36$

$b = \sqrt{36} = 6cm$

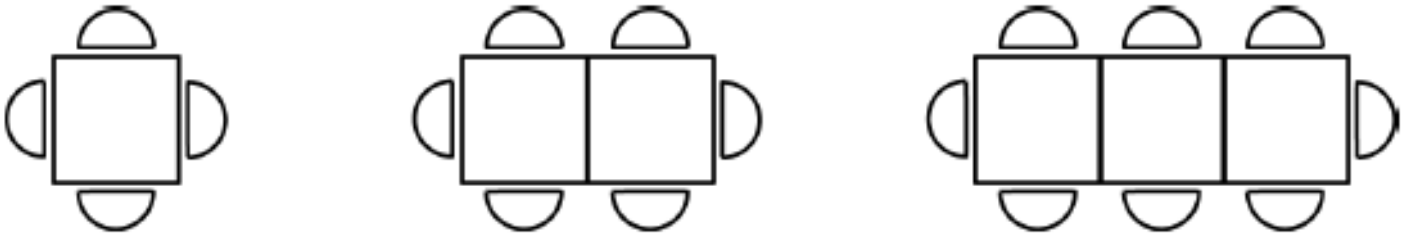


Check answer ! Always smaller than hypotenuse

Starter Questi

ALWAYS comes up in exam !!

In a restaurant, tables and chairs are set out as shown below.



1 table 2 tables 3 tables

(*a*) Complete this table.

Number of tables	1	2	3	4	5	6		13
Number of chairs	4	6						

(*b*) Write down a rule for finding the number of chairs if you know the number of tables.

Finding the Length of a Line

Learning Intention

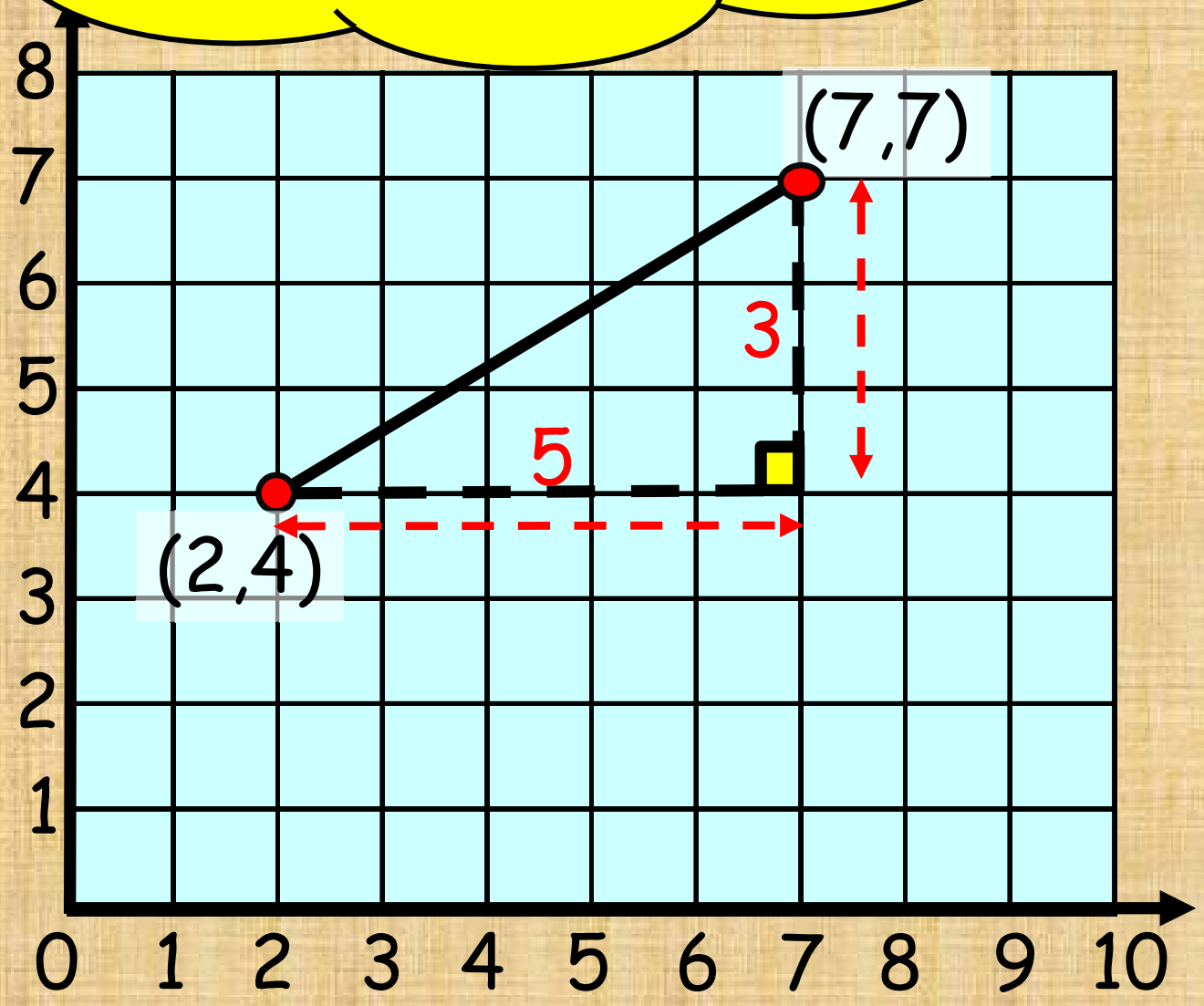
1. To show how Pythagoras Theorem can be used to find the length of a line.

Success Criteria

1. Apply Pythagoras Theorem to find length of a line.

2. Show all working.

Discuss with your partner how we might find the length of the line.



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

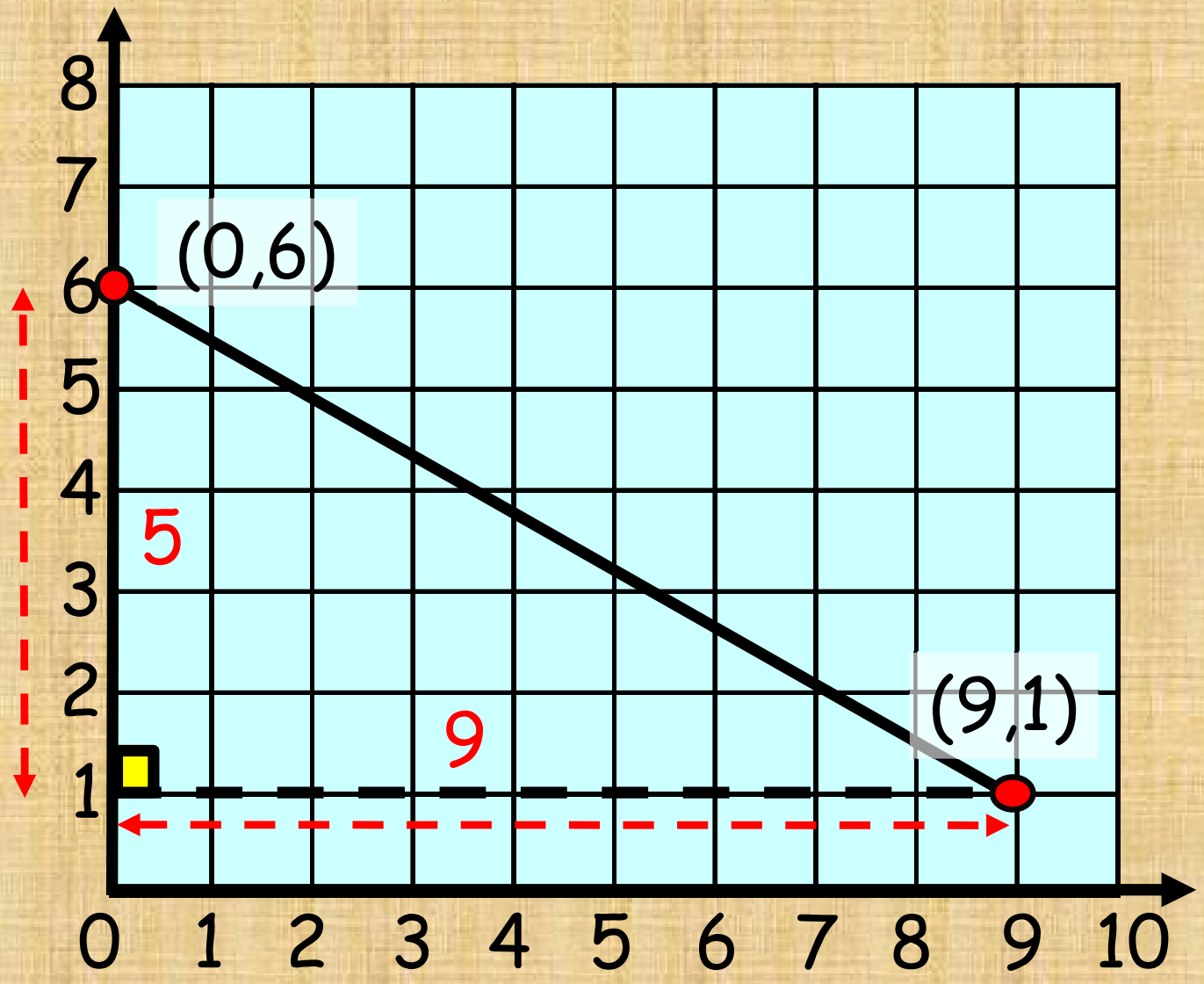
$$c^2 = 5^2 + 3^2$$

$$c = \sqrt{25+9}$$

$$c = \sqrt{34}$$

$$c = 5.83$$

Pythagoras Theorem to find the length of a Line



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

$$c^2 = 5^2 + 9^2$$

$$c = \sqrt{25 + 81}$$

$$c = \sqrt{106}$$

$$c = 10.3$$

Pythagoras Theorem

Learning Intention

1. To use knowledge already gained on Pythagoras Theorem to solve mixed problems using appropriate version of Theorem.

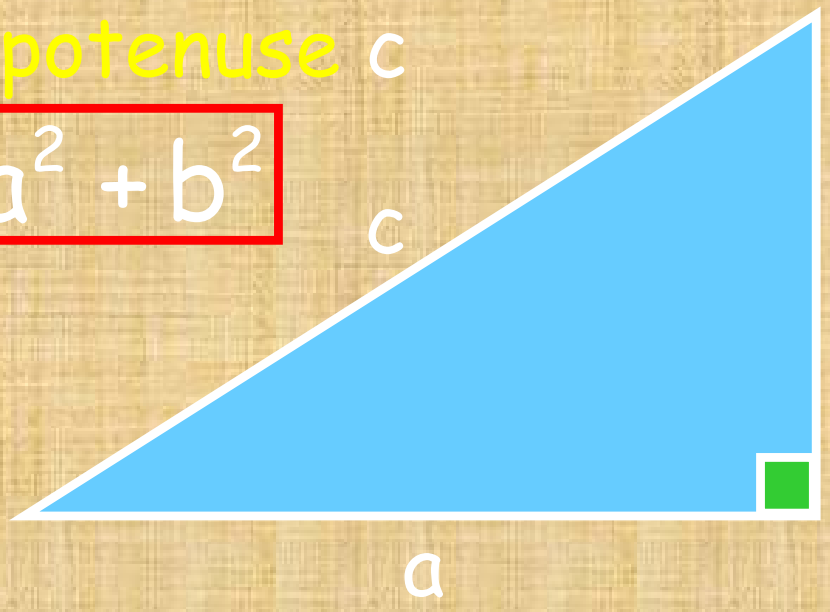
Success Criteria

1. Use the appropriate form Pythagoras Theorem to solving problems.

Pythagoras Theorem

Finding hypotenuse c

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



Finding shorter side b

$$b^2 = c^2 - a^2$$

Finding shorter side a

$$a^2 = c^2 - b^2$$