

# Quantitative Methods

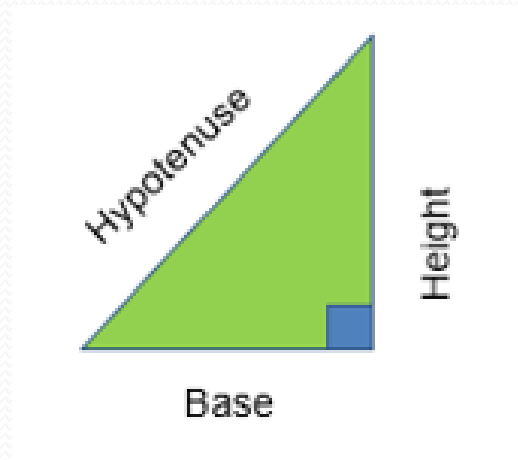
# Pythagoras' Theorem

Module No. Cons 1012

Lecturer Jennifer Byrne

# Pythagoras's Theorem

- **Pythagoras' Theorem:** The Square on the Hypotenuse is equal to the sum of the squares on the other two sides.



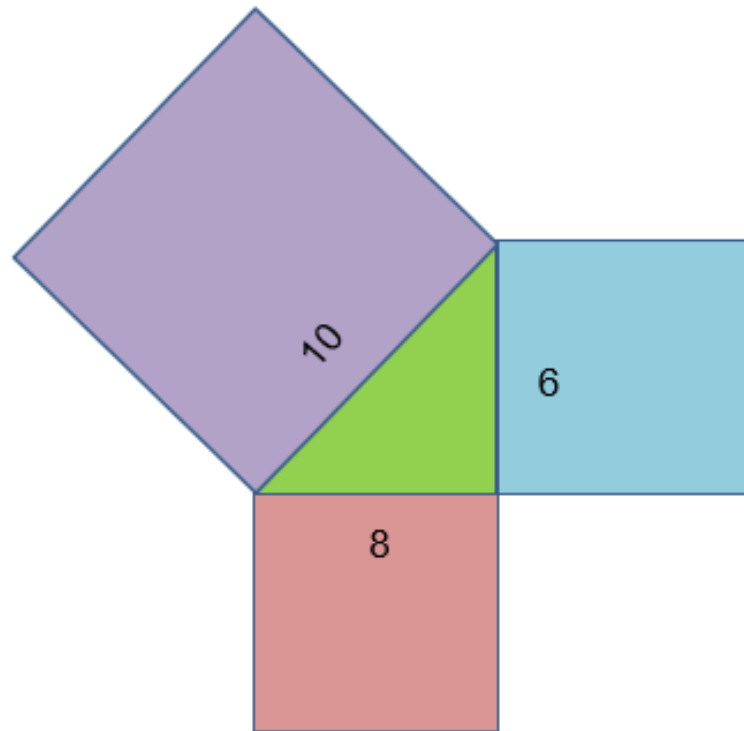
- Only works with a right-angled triangle that is a triangle with an angle of  $90^\circ$ .
- In any right-angled triangle, if we have two sides we can calculate the other side using Pythagoras' theorem.

# Pythagoras's Theorem

- **Formula:**  $a^2 + b^2 = c^2$
- $8^2 + 6^2 = 10^2$
- $64 + 36 = 100$
- $\sqrt{100} = 10$



$\square + \square = \square$



# Pythagoras's Theorem

- **Example 1**

- **Formula:**  $a^2 + b^2 = c^2$

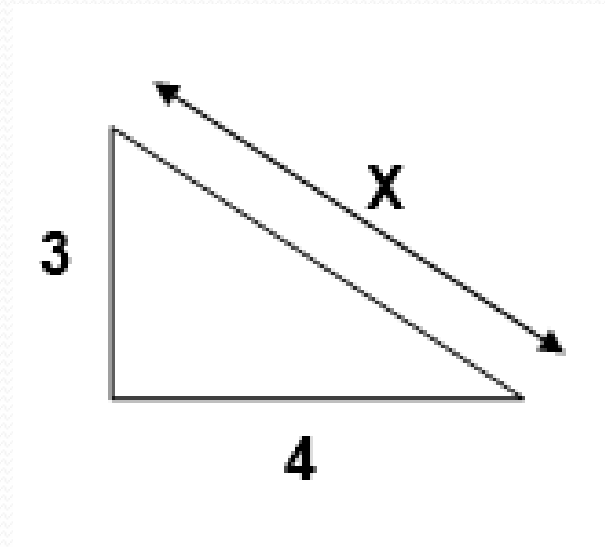
- $3^2 + 4^2 = x^2$

- $9 + 16 = x^2$

- $25 = x^2$

- $\sqrt{25} = x$

- $5 = x$



# Pythagoras's Theorem

- **Example 2**

- **Formula:**  $a^2 + b^2 = c^2$

- $10^2 + x^2 = 18^2$

- $100 + x^2 = 324$

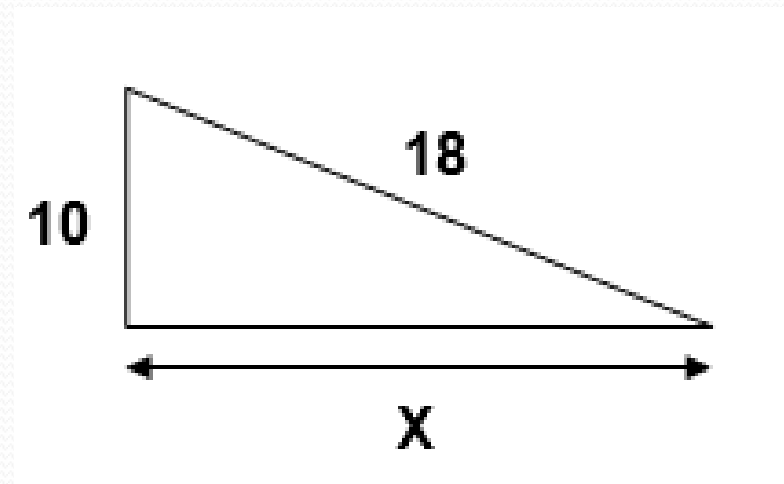
- $x^2 = 324 - 100$

- $x^2 = 224$

- $x = \sqrt{224}$

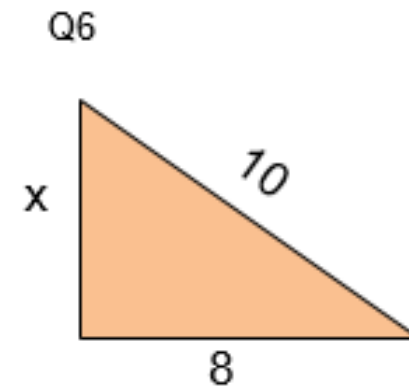
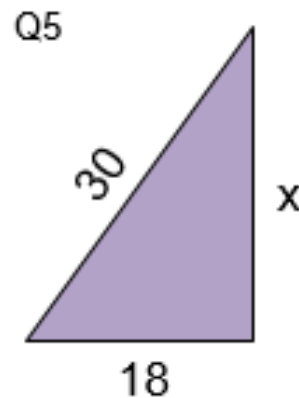
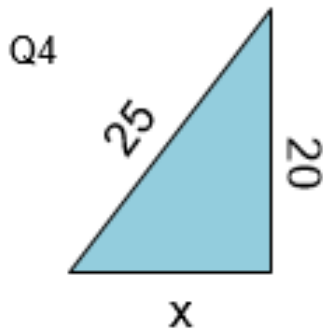
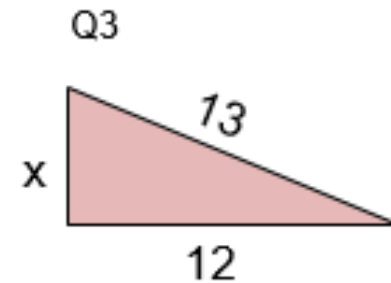
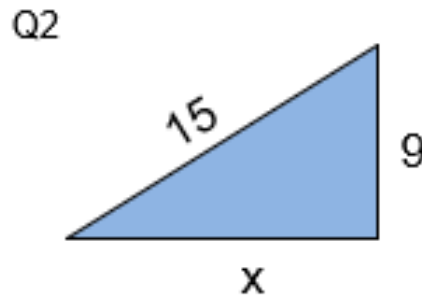
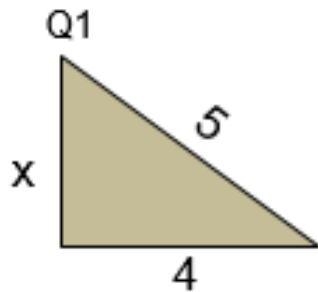
- $x = 14.96662$

- $x = 14.967$



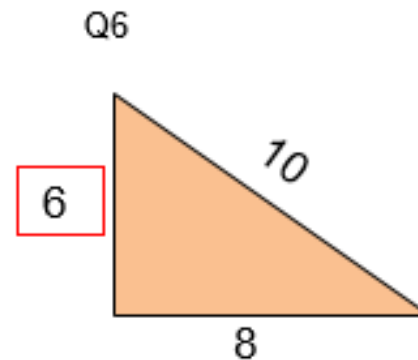
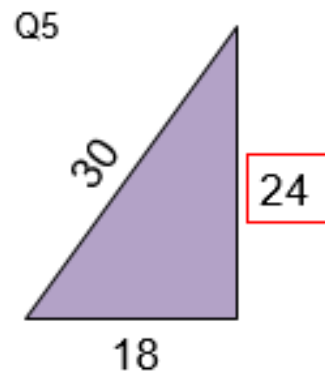
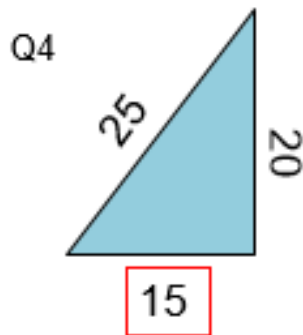
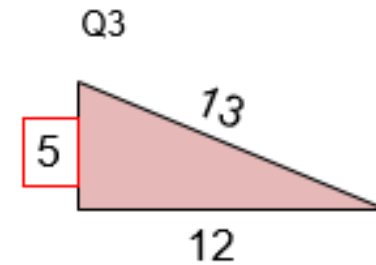
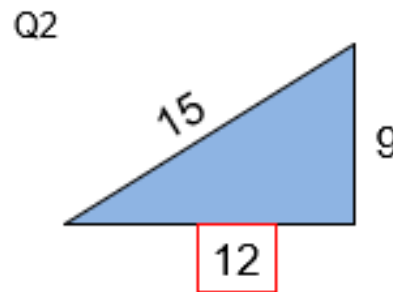
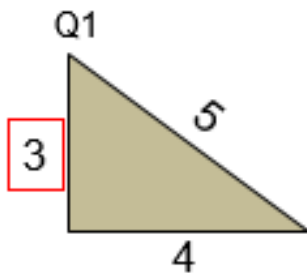
# Pythagoras's Theorem

- Find the missing length of each triangle



# Pythagoras's Theorem

- The missing length of each triangle shown in red box.



# Pythagoras's Theorem

## Solution Q1

- $5^2 = X^2 + 4^2$
- $5^2 - 4^2 = X^2$
- $25 - 16 = X^2$
- $9 = X^2$
- $\sqrt{9} = 3$

## Solution Q2

- $15^2 = X^2 + 9^2$
- $15^2 - 9^2 = X^2$
- $225 - 81 = X^2$
- $144 = X^2$
- $\sqrt{144} = 12$



# Pythagoras's Theorem

## Solution Q3

- $13^2 = 2^2 + 12^2$
- $13^2 - 12^2 = X^2$
- $169 - 144 = X^2$
- $25 = X^2$
- $\sqrt{25} = 5$

## Solution Q4

- $25^2 = X^2 + 20^2$
- $25^2 - 20^2 = X^2$
- $625 - 400 = X^2$
- $225 = X^2$
- $\sqrt{225} = 15$

# Pythagoras's Theorem

## Solution Q5

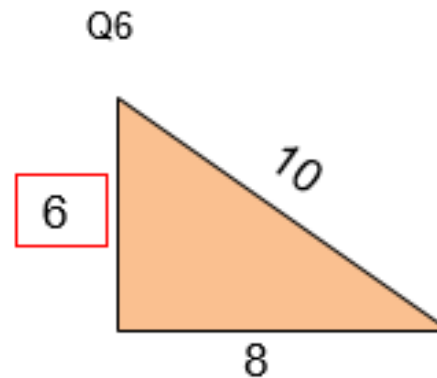
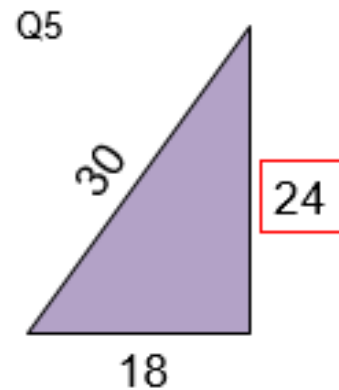
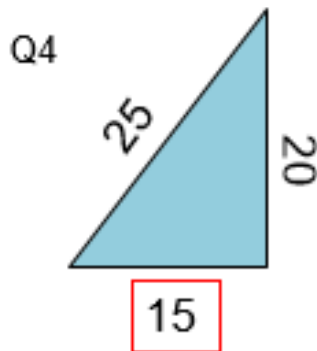
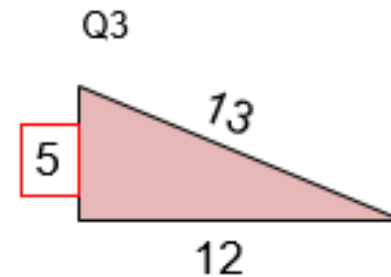
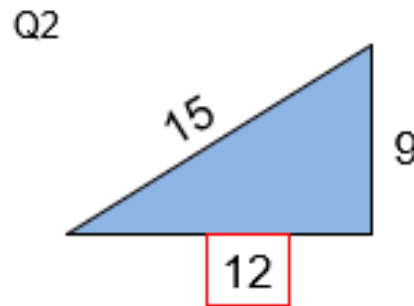
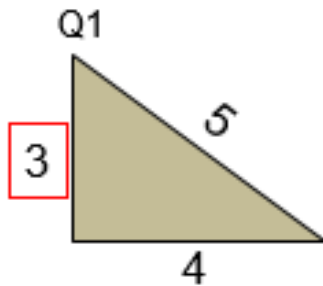
- $30^2 = X^2 + 18^2$
- $30^2 - 18^2 = X^2$
- $900 - 324 = X^2$
- $576 = X^2$
- $\sqrt{576} = 24$

## Solution Q6

- $10^2 = X^2 + 8^2$
- $10^2 - 8^2 = X^2$
- $100 - 64 = X^2$
- $36 = X^2$
- $\sqrt{36} = 6$

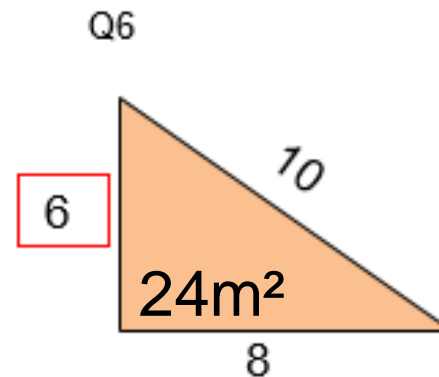
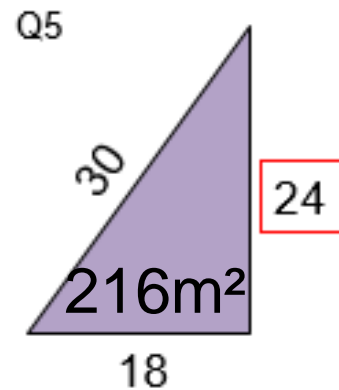
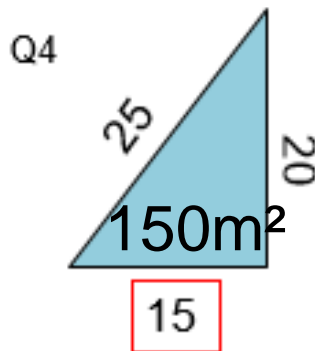
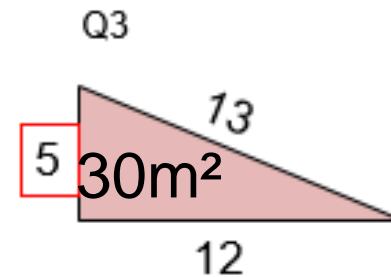
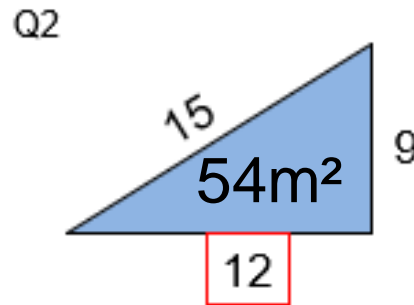
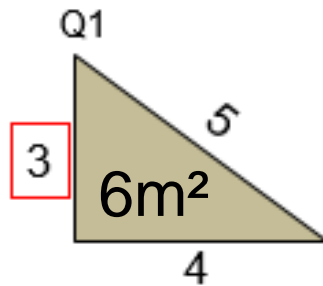
# Area of Triangles

- Find the area of each triangle.



# Area of Triangles

- The area of each triangle.



# Area of Triangle

$\frac{1}{2}$  base x perp. Height = area

## Solutions

- Q 1  $\frac{1}{2} (4) \times 3 =$  or  $(4/2) \times 3 = 2 \times 3 = 6\text{m}^2$
- Q 2  $\frac{1}{2} (9) \times 12 =$  or  $(9/2) \times 12 = 4.5 \times 12 = 54\text{m}^2$
- Q 3  $\frac{1}{2} (5) \times 12 =$  or  $(5/2) \times 12 = 2.5 \times 12 = 30\text{m}^2$
- Q 4  $\frac{1}{2} (20) \times 15 =$  or  $(20/2) \times 15 = 10 \times 15 = 150\text{m}^2$
- Q 5  $\frac{1}{2} (18) \times 30 =$  or  $(18/2) \times 30 = 9 \times 30 = 270\text{m}^2$
- Q 6  $\frac{1}{2} (6) \times 8 =$  or  $(6/2) \times 10 = 3 \times 8 = 24\text{m}^2$