Western Cape Government
Education

MATHEMATICS
GRADE 8

DATE: ....

TOPIC: PYTHAGORAS

CONCEPTS & SKILLS TO BE ACHIEVED:	
By the end of the lesson learners should know and be able to: • Identify the types of triangles, calculate the hypotenuse of a right-angled triangle, understand relationship between the lengths of the sides of right-angled triangles. • Solve problems using the Theorem of Pythagoras. • Use the Theorem of Pythagoras to solve problems involving unknown lengths • Determining if a triangle is a right-angled triangle by using the converse of the theorem of Pythagoras	
RESOURCES:	DBE Workbook, Sasol-Inzalo book, Textbooks,
ONLINE RESOURCES	https://www.visnos.com http://www.virtualnerd.com

DAY 1:

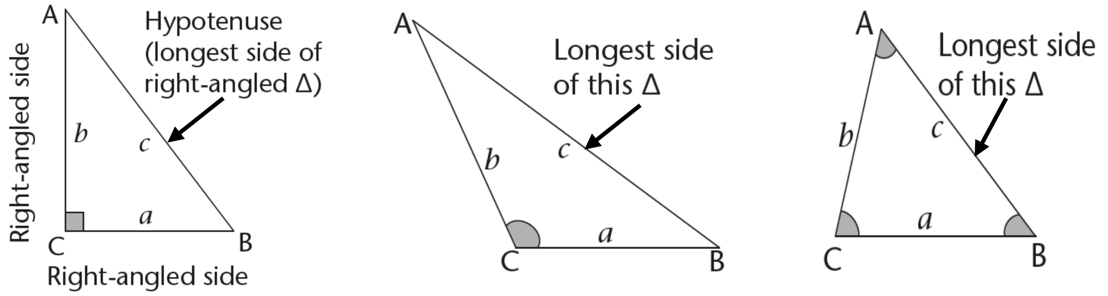
INTRODUCTION: READ THE FOLLOWING TO FAMILAIRISE YOURSELF WITH WHAT THIS TOPIC IS ABOUT:

What do remember about different triangles?

Right-angled triangles:
One angle is 90°

Obtuse-angled triangle:
One angle is obtuse (between 90° and 180°)

Acute-angle triangle:
All angles are acute (less than 90°)



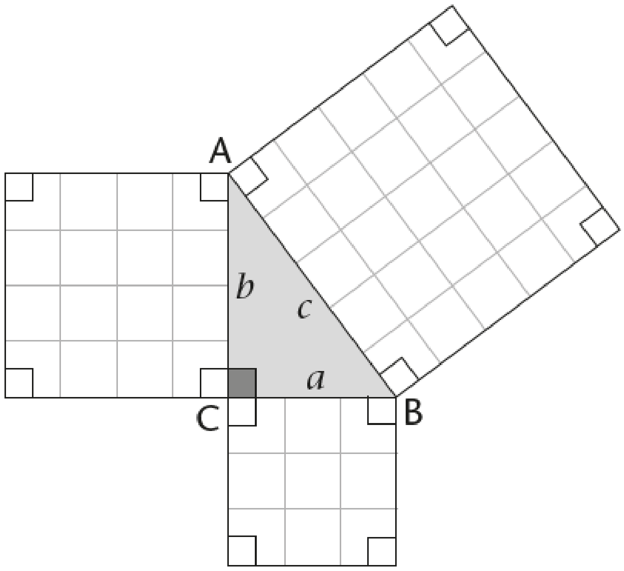
If the vertices of a triangle are labelled A, B and C, the sides opposite these vertices are often labelled as *a*, *b* and *c*, as shown above

We use the word hypotenuse to indicate the side opposite the 90° angle of a right-angled triangle. The hypotenuse is always the longest side of a right -angled triangle A triangle with no right angle will therefore not have a hypotenuse.

LESSON DEVELOPMENT:

INVESTIGATING THE RELATIONSHIP BETWEEN LENGTHS OF SIDES:

Study the figures below. Each triangle has a square drawn on each of its sides.



We can see that this is a right-angled triangle

We can also see that side *a* has three units, side *b* has four units and side *c* has five units.

If we have to calculate the number of units per each square we will see a very interesting fact.

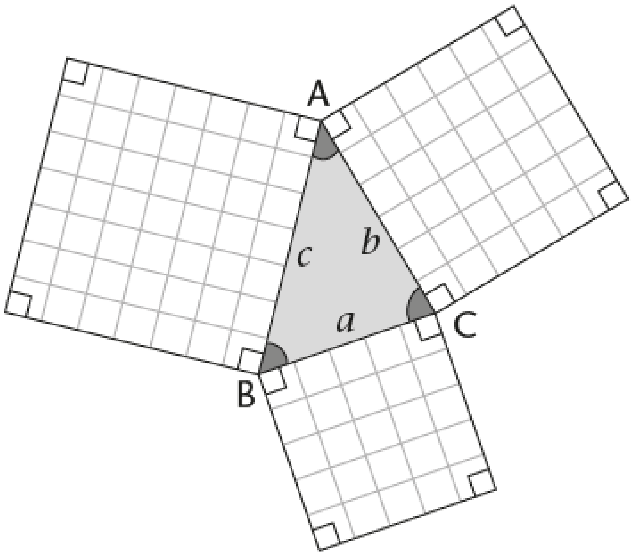
Side	Units per side	Units per square
a	3	9
b	4	16
c	5	25

We can see that by all three sides the units per square is the square of the units per side.

The other observation we can see is that 9 + 16 = 25. We can thus make the following conclusion for right-angled triangles.

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

We can see that this is an acute-angled triangle.



Side	Units per side	Units per square
a	5	25
b	6	36
c	7	49

If we apply what we did above, we will see that it is not true for this triangle

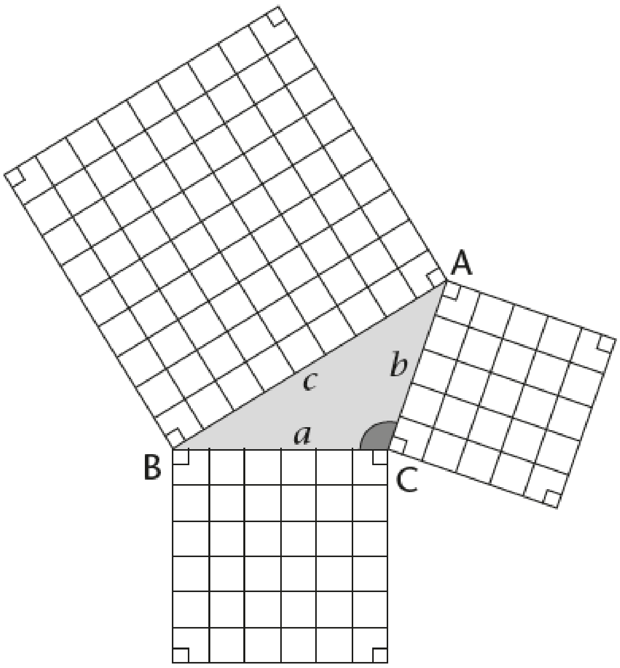
$a^2 + b^2 = 25 + 36$

$= 61$

$c^2 = 49$

We can see that it is not the case but rather

$a^2 + b^2 > c^2$



We can see that this is an obtuse-angled triangle.

Side	Units per side	Units per square
a	6	36
b	5	25
c	9	81

If we apply what we did above, we will see that it is not true for this triangle

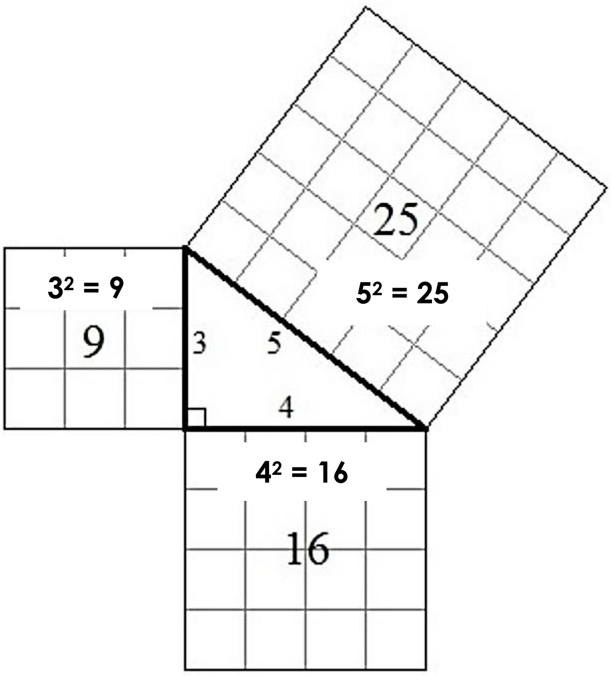
$a^2 + b^2 = 36 + 25$
$= 61$
$c^2 = 81$
We can see that it is not the case but rather
$a^2 + b^2 < c^2$

When we look at the above we can make the deduction that if we have a right-angled triangle we will know that $a^2 + b^2 = c^2$, which is called the theorem of Pythagoras and it is only valid if we have a right-angled triangle.

We do not always have to draw squares with units inside of the squares on the sides of the triangles. Instead of drawing squares we can just square the length of the side and we will have the same values.

EXAMPLE:

Look at the triangle below:



This triangle has both the length of the side as well as the squares with units inside. If we take a closer look we will see that the number of units inside of the squares are equal to the square of the length of the side.

So we can use the same principle as above but without having to count the number of units.

$\mathbf{3^2 + 4^2 = 9 + 16}$
$\mathbf{= 25}$
And we see that $\mathbf{5^2 = 25}$, so we can make the conclusion that this triangle is a right-angled triangle.

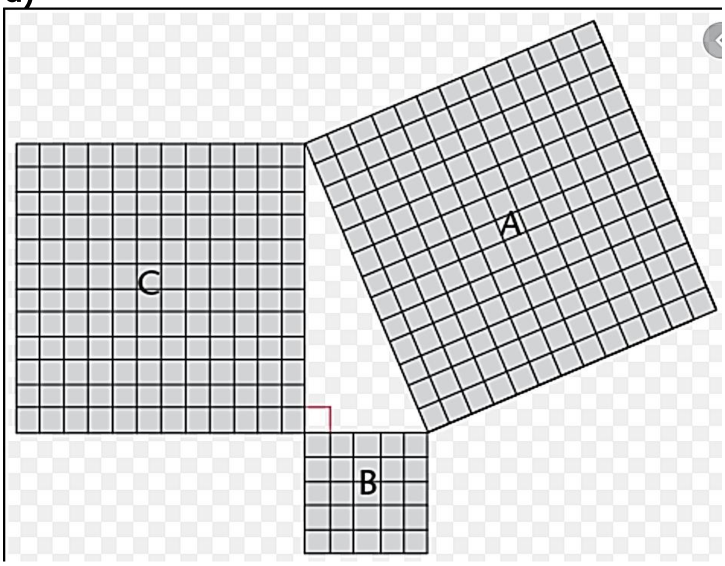
CLASSWORK:

Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:

ACTIVITY 1:

Study the figures below and complete the table below.

a)



b)

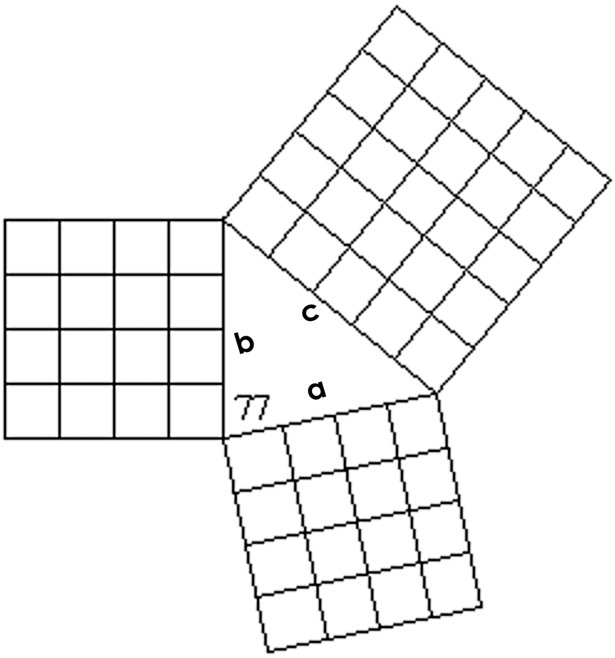


Figure	Length of side a	Length of side b	Length of side c	a^2	b^2	c^2	Type of triangle
a)							
b)							

ACTIVITY 2:

Look at the completed table above and then complete the following statement by inserting =, < or >

$a^2 + b^2$ ___ c^2 when Δ ABC is an acute-angled triangle.
$a^2 + b^2$ ___ c^2 when Δ ABC is an obtuse-angled triangle.
$a^2 + b^2$ ___ c^2 when Δ ABC is a right-angled triangle.

ACTIVITY 3:

State whether the following statement is true or false.

a) In any right-angled triangle, the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the other two sides.
b) If a triangle is acute-angled, then the square of the length of the longest side is equal to the sum of the squares of the lengths of the other two sides.

IT IS IMPORTANT TO REMEMBER:

We use the word hypotenuse to indicate the side opposite the 90° angle of a right-angled triangle. The hypotenuse is always the longest side of a right -angled triangle A triangle with no right angle will therefore not have a hypotenuse.

If we have a right-angled triangle we will know that $a^2 + b^2 = c^2$, which is called the theorem of Pythagoras and it is only valid if we have a right-angled triangle.

Because not all triangles are labelled as A, B and C, we can say that the theorem of Pythagoras is

$$(\text{Side 1})^2 + (\text{Side 2})^2 = (\text{Hypotenuse})^2$$

HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

QUESTION 1:

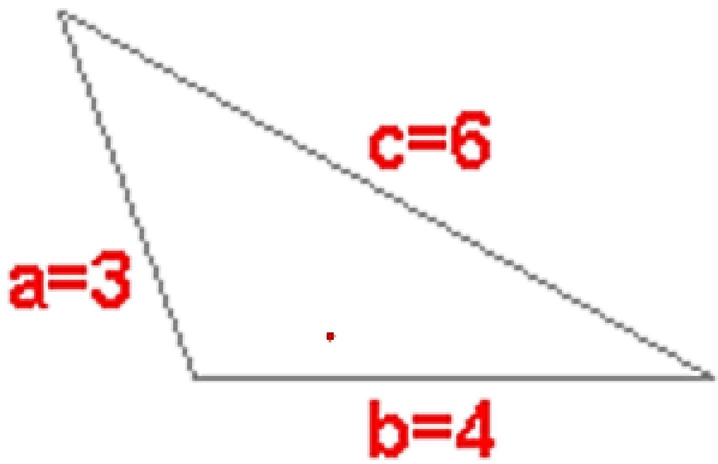
x, y and z are the sides of the triangles, with z always the longest side x^2, y^2 and z^2 are the areas of the squares on those sides.
Complete the table.

	x	x^2	y	y^2	z	z^2	= < >	$x^2 + y^2$	Type of Δ
Δ ABC	2		3		4				
Δ DEF	3		4		5				
Δ GHI	3		4		6				

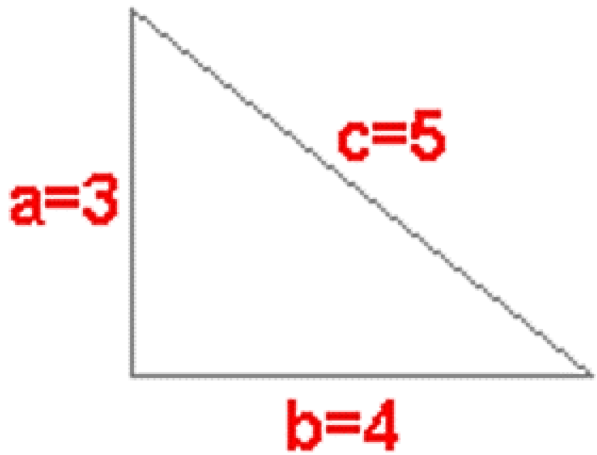
QUESTION 2:

Study the figures below and complete the table below.

a)



b)



c)

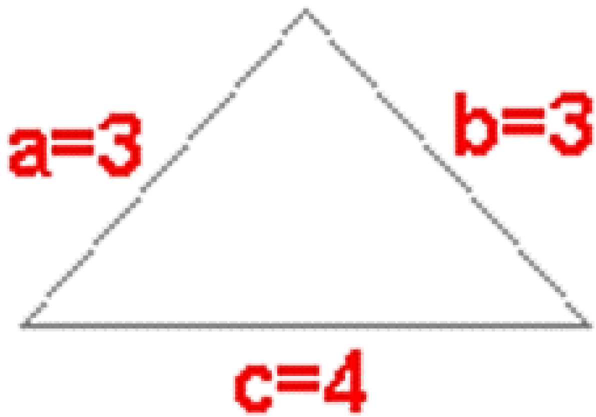


Figure	Type of triangle	Length of side a	Length of side b	Length of side c	a^2	b^2	c^2
a)							
b)							
c)							

QUESTION 3:

State whether the following statement is true or false.

a) If a triangle is right-angled, then the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other sides.

b) In any obtuse-angled triangle, the area of the square on the longest side is equal to the sum of the area of the squares on the other two sides.

MEMORANDUM: DAY 1:

CLASSWORK:

ACTIVITY 1:

Figure	Length of side a	Length of side b	Length of side c	a^2	b^2	c^2	Type of triangle
a)	13	5	12	169	25	144	Right-angled
b)	4	4	5	16	16	25	Acute-angled

ACTIVITY 2:

- **a)** >
- **b)** <
- **c)** =

ACTIVITY 3:

- **a)** True
- **b)** False

HOMEWORK:

QUESTION 1:

	x	x^2	y	y^2	z	z^2	= < >	$x^2 + y^2$	Type of Δ
Δ ABC	2	**4**	3	**9**	4	**16**	**<**	**13**	**Obtuse**
Δ DEF	3	**9**	4	**16**	5	**25**	**=**	**25**	**Right-angled**
Δ GHI	3	**9**	4	**16**	6	**36**	**>**	**25**	**Acute**

QUESTION 2:

Figure	Type of triangle	Length of side a	Length of side b	Length of side c	a^2	b^2	c^2
a)	**Obtuse-angled**	**3**	**4**	**6**	**9**	**16**	**36**
b)	**Right-angled**	**3**	**4**	**5**	**9**	**16**	**25**
c)	**Acute-angled**	**3**	**3**	**4**	**9**	**16**	**16**

QUESTION 3:

- **a)** True
- **b)** False

DAY 2:

LESSON DEVELOPMENT:

WORKING WITH THE THEOREM OF PYTHAGORAS:

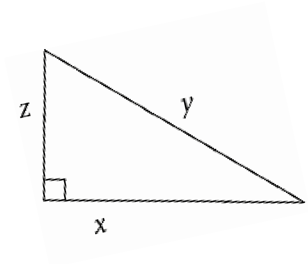
The special relationship between the lengths of a side of a right-angled triangle is known as the theorem of Pythagoras.
It can be stated in terms of areas as follows:

> *If a triangle has a right-angle, then the area of the square with a side on the hypotenuse is equal to the sum of the areas of the squares on the other two sides.*

We can change this to leave the reference of the area out seeing that not all examples will make use of a triangle with squares on the sides.

> *If a triangle is a right-angled triangle, then the square of the length of the hypotenuse is equal to the sum of the square of the lengths of the other two sides.*
>
> ***(Hypotenuse)² = (Side 1)² + (Side 2)²***

We can express this relationship by using the "name" of the sides as well.
Example:



Here the sides are named x, *y* and z. Where z is the hypotenuse.

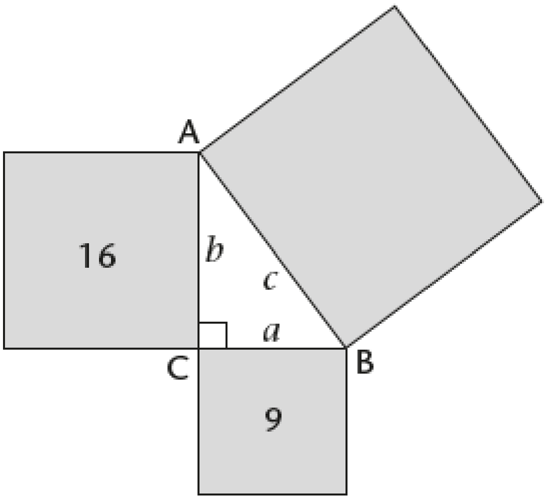
With this is mind the relationship can be written as follows:

$\mathbf{x^2 + y^2 = z^2}$

We can use this method with any triangle.

When we understand the relationship we can calculate the length of the hypotenuse if the other two sides are known.

EXAMPLE:
Consider the triangle below. Side *a* is three units long and side *b* is four units long.
What is the length of side c?



If side a is three units long and side b is four units long, then according to Pythagoras' theorem:
$c^2 = a^2 + b^2$
$c^2 = 3^2 + 4^2$
$c^2 = 9 + 16$
$c^2 = 25$

We know have the square of side c, so we need to square root ($\sqrt{\ }$) it now to determine the length of c
$\therefore c = \sqrt{25}$
$\therefore c = 5$ units.

If we get to a situation where the answer is not a perfect square, we leave it in surd form. Surd form – is when a number cannot be simplified to remove the square root. E.g. $\sqrt{8}$.

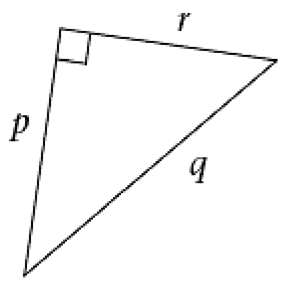
CLASSWORK:

Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:

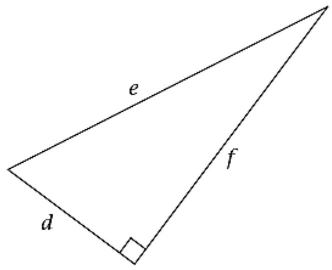
ACTIVITY 1:

Write a Pythagorean equation for each of the following triangles.

a)

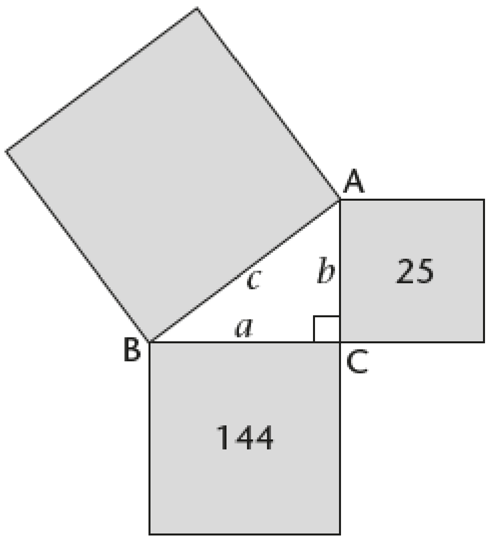


b)



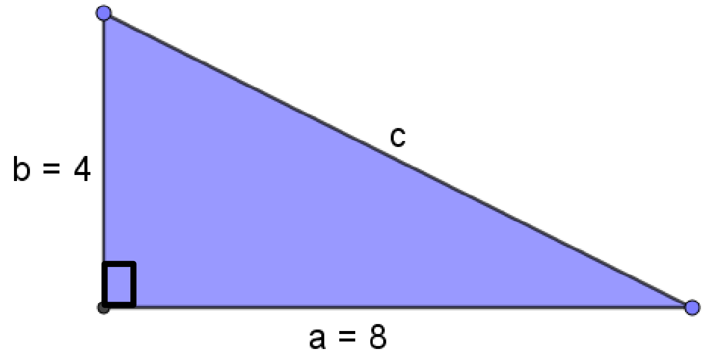
ACTIVITY 2:

Study the following triangle. The area of the squares is given. Calculate the area of the square on the hypotenuse and the lengths of all the sides.



ACTIVITY 3:

Study the following triangle. Calculate the lengths of the hypotenuse, leave your answer in surd form if necessary.



IT IS IMPORTANT TO REMEMBER:

If a triangle is a right-angled triangle, then the square of the length of the hypotenuse is equal to the sum of the square of the lengths of the other two sides.

(Hypotenuse)² = (Side 1)² + (Side 2)²

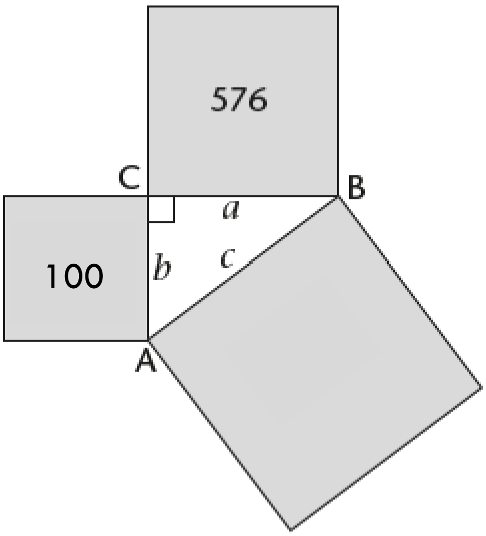
If we get to a situation where the answer is not a perfect square, we leave it in surd form. Surd form – is when a number cannot be simplified to remove the square root. E.g. $\sqrt{8}$.

HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

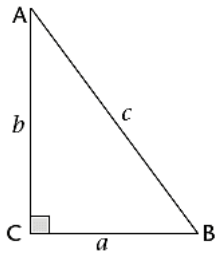
QUESTION 1:

Study the following triangle. The area of the squares is given. Calculate the area of the square on the hypotenuse and the lengths of all the sides.



QUESTION 2:

The following table gives information about the sides of five right-angled triangles. The letter symbol c represents the length of the hypotenuse in all cases. Use Pythagoras' theorem to complete the table, leaving answers in surd form if necessary.

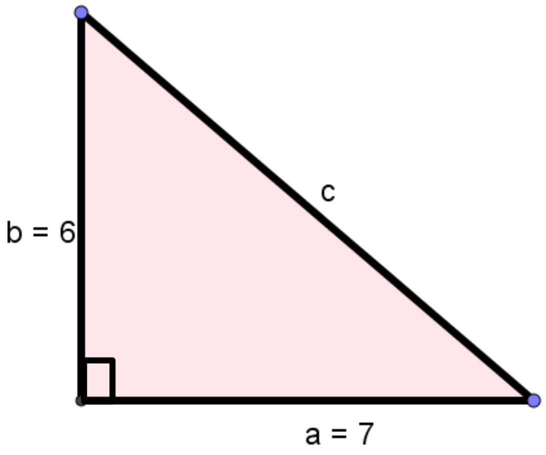


a	b	c	a^2	b^2	$a^2 + b^2$	c^2
7	24					
16		34				
10				576		
			16	49		
	1		1			

QUESTION 3:

Study the following triangles. Calculate the lengths of the hypotenuse.

a)



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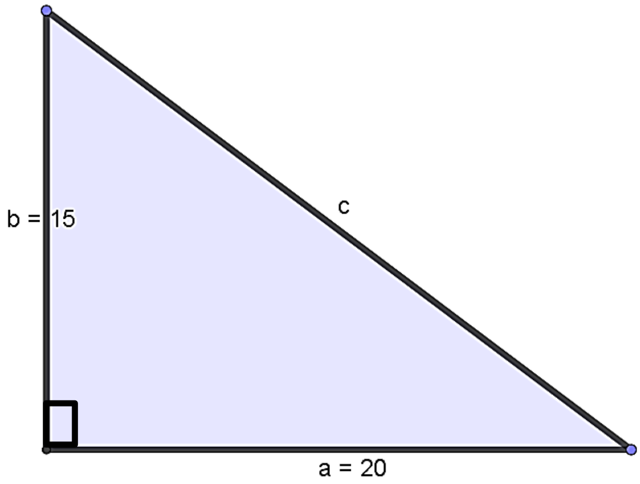


MEMORANDUM: DAY 2:

CLASSWORK:

ACTIVITY 1:

a) $q^2 = r^2 + p^2$
b) $e^2 = d^2 + f^2$

ACTIVITY 2:

Square of the hypotenuse = square of side a + square of side b
Square of the hypotenuse = 144 +25
Square of the hypotenuse = 169

Side a = $\sqrt{144}$

Side a = 12

Side b = $\sqrt{25}$
Side b = 5

Side c = $\sqrt{169}$
Side c = 13

ACTIVITY 3:
$c^2 = a^2 + b^2$
$c^2 = 8^2 + 4^2$
$c^2 = 64 + 16$
$c^2 = 80$
$c = \sqrt{80}$
$c = 4\sqrt{5}$

HOMEWORK:
QUESTION 1:
Square of the hypotenuse = square of side a + square of side b
Square of the hypotenuse = 576 +100
Square of the hypotenuse = 676

Side a = $\sqrt{576}$
Side a = 24

Side b = $\sqrt{100}$
Side b = 100

Side c = $\sqrt{676}$
Side c = 26

QUESTION 2:

a	b	c	a^2	b^2	$a^2 + b^2$	c^2
7	24	**25**	**49**	**576**	**625**	**625**
16	**30**	34	**256**	**900**	**1 156**	**1 156**
10	**24**	**26**	**100**	576	**676**	**676**
4	**7**	$\sqrt{65}$	16	49	**65**	**65**
1	1	$\sqrt{2}$	1	**1**	**2**	**2**

QUESTION 3:

a) $c^2 = a^2 + b^2$
$c^2 = 7^2 + 6^2$
$c^2 = 49 + 36$
$c^2 = 85$
$c = \sqrt{85}$
$c = \sqrt{85}$

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

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

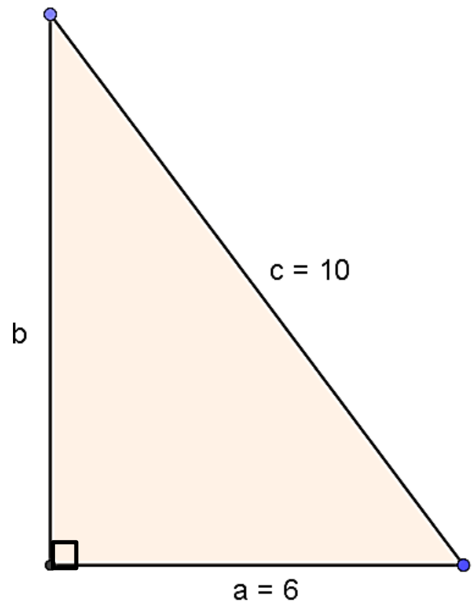
DAY 3:

LESSON DEVELOPMENT:
FINDING THE MISSING SIDES IN RIGHT-ANGLED TRIANGLES:

By understanding the basics of algebraic equations and applying that to the theorem of Pythagoras we can calculate the length of any of the three sides if we know the lengths of two of the other sides.

In the previous lesson we went through the steps to calculate the length of the hypotenuse. We will use a similar procedure to calculate one of the other sides.

EXAMPLE:



From our previous lessons we know that the following is true for this example:

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

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

(by using the additive inverse we can isolate the variable)

OR

We can manipulate the equation to isolate b^2.
$\boldsymbol{b^2 = c^2 - a^2}$
$b^2 = 10^2 - 6^2$
$b^2 = 100 - 36$
$b^2 = 64$
$b = \sqrt{64}$
$b = 8$

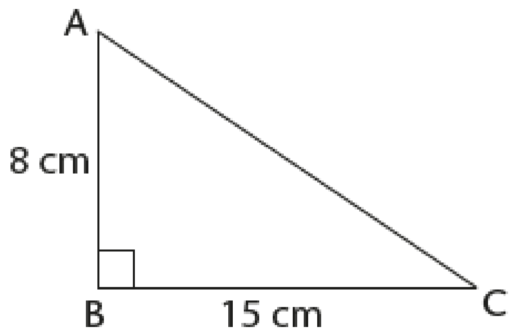
CLASSWORK:

Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:

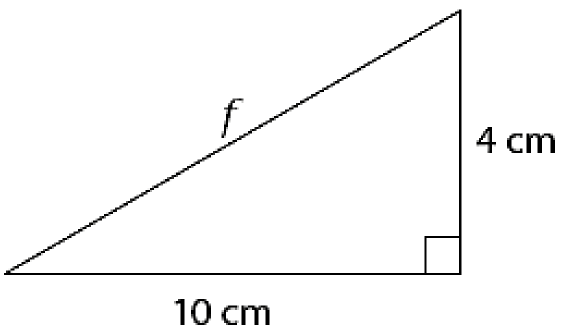
ACTIVITY 1:

Use the formula for the theorem of Pythagoras to calculate the length of the hypotenuse.

a)



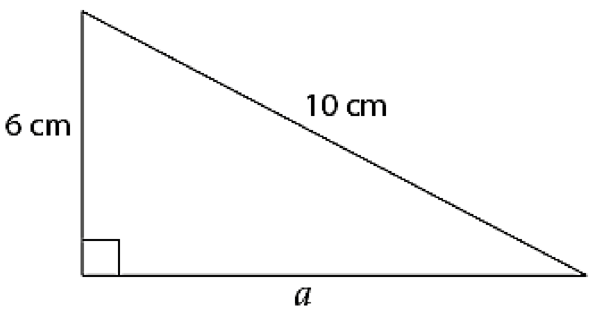
b)



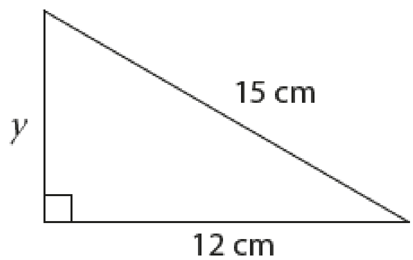
ACTIVITY 2:

Calculate the missing sides in the following triangles. Leave the answers in simplest surd form where necessary.

a)



b)



ACTIVITY 3:

A right-angled triangle with a hypotenuse c and sides of the following lengths:
a = 9 cm and b = 40 cm.
Calculate the length of the hypotenuse.

IT IS IMPORTANT TO REMEMBER:

By using the theorem of Pythagoras we can determine the length of any side as long as we have the lengths of the two other sides. You can do this by either substituting the side lengths into the formula and using the additive inverse to isolate the variable or you can manipulate the formula at the beginning before you substitute the side lengths.

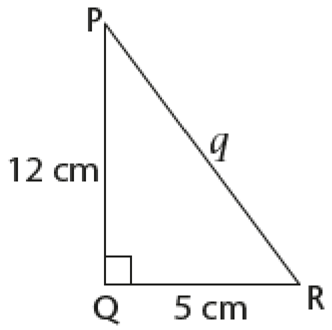
HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

QUESTION 1:

Use the formula for the theorem of Pythagoras to calculate the length of the hypotenuse. Leave answers in surd form where necessary.

a)



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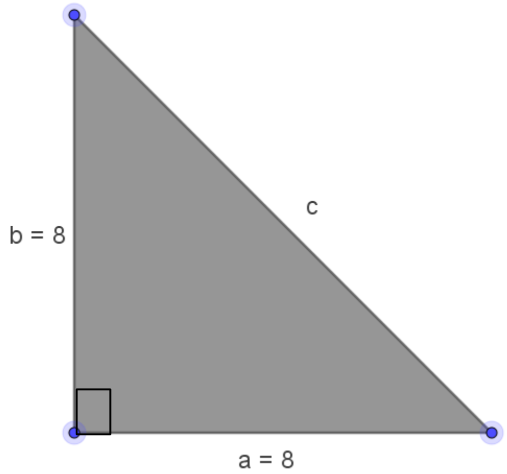


QUESTION 2:

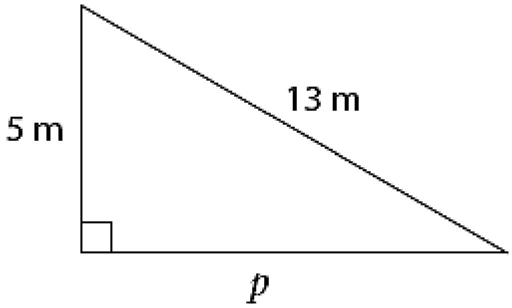
A right-angled triangle with a hypotenuse c and sides of the following lengths:
a = 12 cm and b = 36 cm.

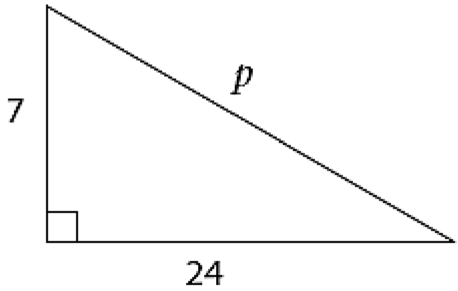
Calculate the length of the hypotenuse.

QUESTION 3:

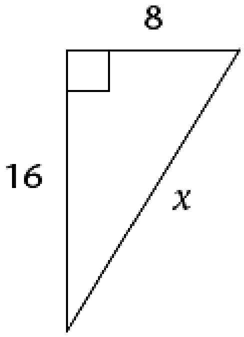
Use the theorem of Pythagoras and calculate the length of the unknown sides.

a) **b)**





c)



MEMORANDUM: DAY 3:

CLASSWORK:

ACTIVITY 1

a) $AC^2 = BC^2 + AB^2$
$AC^2 = 15^2 + 8^2$
$AC^2 = 225 + 64$
$AC^2 = 289$
$AC = \sqrt{289}$
$AC = 17$

b) $f^2 = 10^2 + 4^2$
$f^2 = 100 + 16$
$f^2 = 116$
$f = \sqrt{116}$
$f = 2\sqrt{29}$

ACTIVITY 2:

a) $a^2 = 10^2 - 6^2$
$a^2 = 100 - 36$
$a^2 = 64$
$a = \sqrt{64}$
$a = 8$

b) $y^2 = 15^2 - 12^2$
$y^2 = 225 - 144$

$y^2 = 81$
$y = \sqrt{81}$
$y = 9$

ACTIVITY 3:
$c^2 = a^2 + b^2$
$c^2 = 9^2 + 40^2$
$c^2 = 81 + 1\ 600$
$c^2 = 1\ 681$
$c = \sqrt{1\ 681}$
$c = 41$

HOMEWORK:
QUESTION 1:
a) $q^2 = 5^2 + 12^2$
$q^2 = 25 + 144$
$q^2 = 169$
$q = \sqrt{169}$
$q = 13$

b) $c^2 = a^2 + b^2$
$c^2 = 8^2 + 8^2$
$c^2 = 64 + 64$
$c^2 = 128$
$c = \sqrt{128}$
$c = 8\sqrt{2}$

QUESTION 2:
$c^2 = a^2 + b^2$
$c^2 = 12^2 + 36^2$
$c^2 = 144 + 1\ 296$
$c^2 = 1\ 440$
$c = \sqrt{1\ 440}$
$c = 12\sqrt{10}$

QUESTION 3:
a) $p^2 = 13^2 - 5^2$
$p^2 = 169 - 25$
$p^2 = 144$
$p = \sqrt{144}$
$p = 12$

b) $p^2 = 24^2 + 7^2$
$p^2 = 576 + 49$
$p^2 = 625$
$p = \sqrt{625}$
$p = 25$

c) $x^2 = 8^2 + 16^2$
$x^2 = 64 + 256$
$x^2 = 320$

$x = \sqrt{320}$
$x = 8\sqrt{5}$

DAY 4:

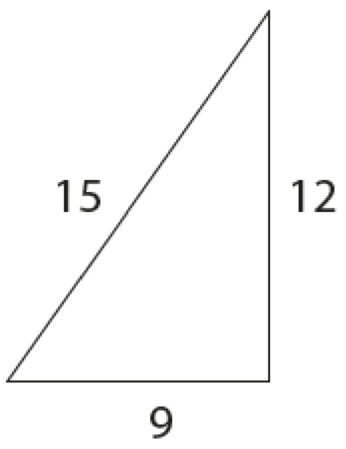
LESSON DEVELOPMENT:
ARE THE TRIANGLES RIGHT-ANGLED?

In the previous lessons we learnt that in a right-angled triangle the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the other two sides. How can we tell whether a triangle is right-angled if we are given the lengths of the sides? One way is to use the "converse" of Pythagoras theorem.

The converse states:
If the sum of the squares of the lengths of two sides equals the squares of the length of the longest side, then the triangle is a right-angled triangle.

We can also state the converse as follows

If a triangle has side lengths a, b and c such that $c^2 = a^2 + b^2$, then the triangle is a right-angled triangle.
EXAMPLE:
Determine whether the following triangle is right-angled or not?



(Length of longest side)$^2 = 15^2$
(Length of longest side)$^2 = 225$

Sum of the squares of the lengths of the other two sides
$= 9^2 + 12^2$
$= 81 + 144$
$= 225$

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $15^2 = 9^2 + 12^2$
$\therefore$ The triangle is right-angled.

If the values are not equal to each other, the triangle is not a right-angled triangle.

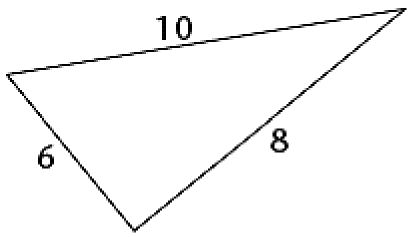
CLASSWORK:

Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:

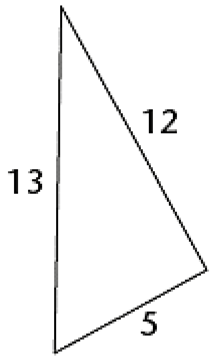
ACTIVITY 1:

Determine whether the following triangles are right-angled or not.

a)



b)



ACTIVITY 2:

Determine whether the triangle with the following measurements are right-angled or not.

a) Sides measuring six, nine and 15 units.
b) Sides measuring 6 cm, 10 cm and 12 cm.
c) Sides measuring 37 units, 35 units and 12 units.

IT IS IMPORTANT TO REMEMBER:

If we have the lengths of the sides of a triangle, then you can determine whether the triangle will be a right-angled triangle by using the converse of Pythagoras' theorem.

The converse states:
If the sum of the squares of the lengths of two sides equals the squares of the length of the longest side, then the triangle is a right-angled triangle.

We can also state the converse as follows

If a triangle has side lengths a, b and c such that $c^2 = a^2 + b^2$, then the triangle is a right-angled triangle.

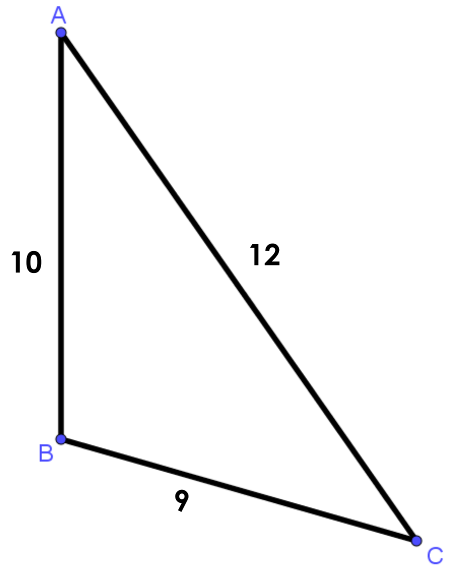
HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

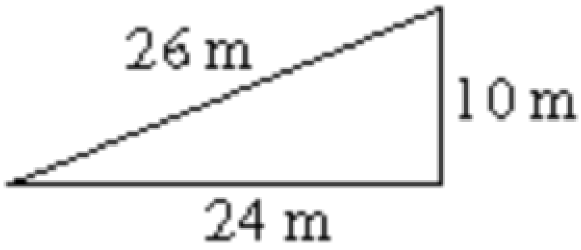
QUESTION 1:

Determine whether the following triangles are right-angled or not.

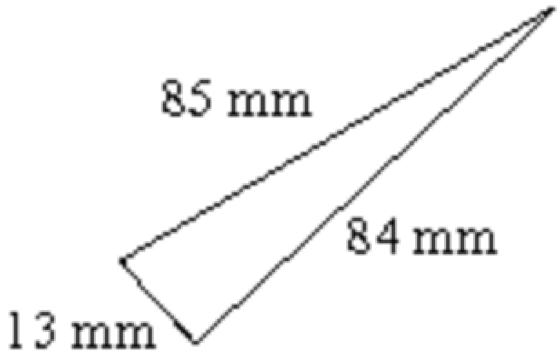
a)



b)



c)



QUESTION 2:
Determine whether the triangle with the following measurements are right-angled or not.

a) Sides measuring 7, 24 and 15 units.
b) Sides measuring 20 cm, 25 cm and 30 cm.
c) Sides measuring 30 units, 33 units and 35 units.

MEMORANDUM: DAY 4:

CLASSWORK:
ACTIVITY 1:

a) (Length of longest side)^2 = 10^2
(Length of longest side)^2 = 100

Sum of the squares of the lengths of the other two sides
= $6^2 + 8^2$
= 36 + 64
= 100

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $10^2 = 6^2 + 8^2$
$\therefore$ The triangle is right-angled.

b) (Length of longest side)^2 = 13^2
(Length of longest side)^2 = 169

Sum of the squares of the lengths of the other two sides
$= 5^2 + 12^2$
$= 25 + 144$
$= 169$

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $13^2 = 5^2 + 12^2$
$\therefore$ The triangle is right-angled.

ACTIVITY 2:

a) (Length of longest side)^2 = 15^2
(Length of longest side)^2 = 225

Sum of the squares of the lengths of the other two sides
$= 6^2 + 9^2$
$= 36 + 81$
$= 117$

(Longest side length)^2 $\neq$ Sum of squares of other two side lengths
$\therefore$ The triangle is not a right-angled triangle.

b) (Length of longest side)^2 = 12^2
(Length of longest side)^2 = 144

Sum of the squares of the lengths of the other two sides
$= 6^2 + 10^2$
$= 36 + 100$
$= 136$

(Longest side length)^2 $\neq$ Sum of squares of other two side lengths
$\therefore$ The triangle is not a right-angled triangle.

c) (Length of longest side)^2 = 37^2
(Length of longest side)^2 = 1 369

Sum of the squares of the lengths of the other two sides
$= 35^2 + 12^2$
$= 1\ 225 + 144$
$= 1\ 369$

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $37^2 = 35^2 + 12^2$
$\therefore$ The triangle is right-angled.

HOMEWORK:

QUESTION 1:

a) (Length of longest side)^2 = 12^2
(Length of longest side)^2 = 144

Sum of the squares of the lengths of the other two sides
= $9^2 + 10^2$
= 81 + 100
= 181

(Longest side length)^2 ≠ Sum of squares of other two side lengths
∴ The triangle is not a right-angled triangle.

b) (Length of longest side)^2 = 26^2
(Length of longest side)^2 = 676

Sum of the squares of the lengths of the other two sides
= $24^2 + 10^2$
= 576 + 100
= 676

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $26^2 = 24^2 + 10^2$
∴ The triangle is right-angled.

c) (Length of longest side)^2 = 85^2
(Length of longest side)^2 = 7 225

Sum of the squares of the lengths of the other two sides
= $84^2 + 13^2$
= 7 056 + 169
= 7 225

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $85^2 = 84^2 + 13^2$
∴ The triangle is right-angled.

DAY 5:

CONSOLIDATION:

TODAY WE WILL WORK THROUGH MORE EXAMPLES TO CONSOLIDATE WHAT YOU HAVE LEARNT ABOUT PYTHAGORAS' THEOREM.

HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

QUESTION 1:

Complete the following statement:

The theorem of ____________ states that in a ____________ triangle, the square of the ____________ equals the ____________ of the other two ____________.

QUESTION 2:

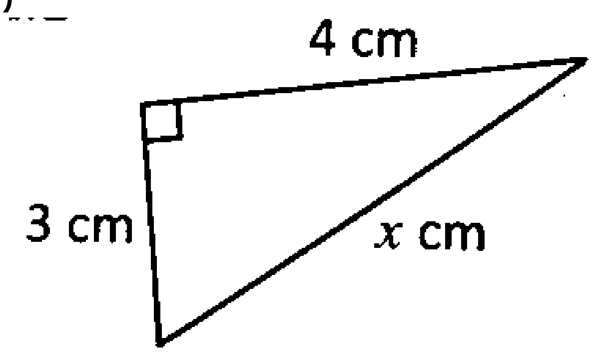
Classify the following triangles as acute-, right- or obtuse-angled if:

a) $p = 5$ units, $q = 8$ units and $r = 9$ units.
b) $p = 37$ units, $q = 35$ units and $r = 12$ units.
c) $p = 9$ units, $q = 12$ units and $r = 15$ units.

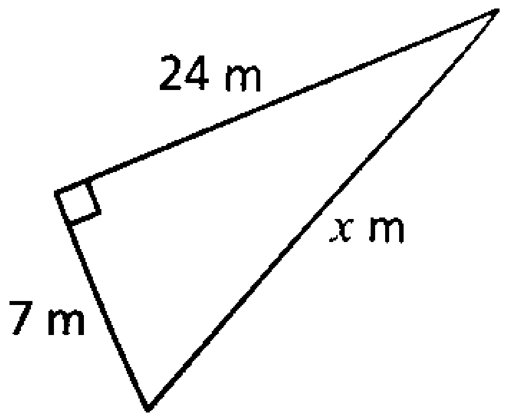
QUESTION 3:

Calculate the value of x. Leave your answer in simplest surd form where necessary.

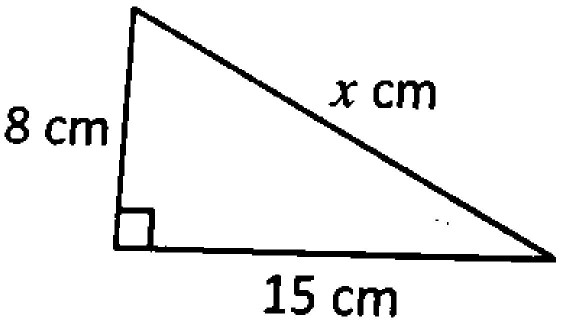
a)



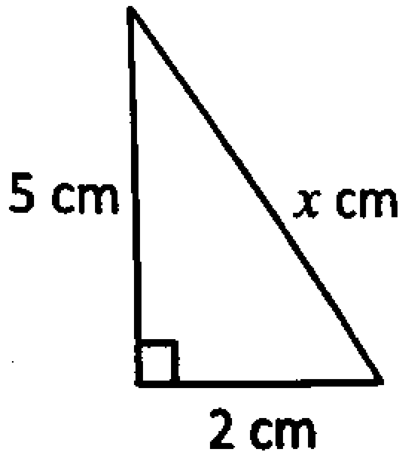
b)



c)



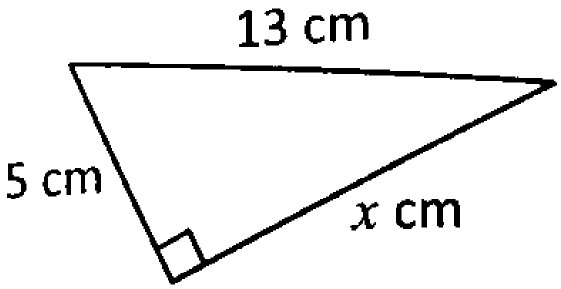
d)



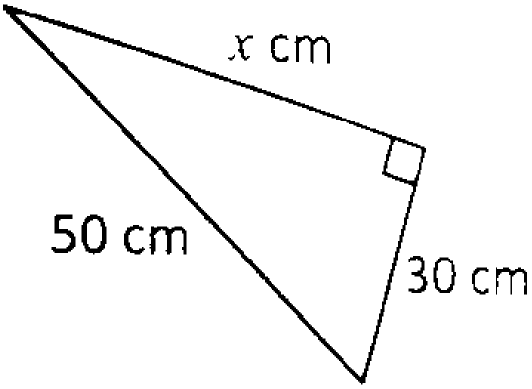
QUESTION 4:

Calculate the value of x. Leave your answer in simplest surd form where necessary.

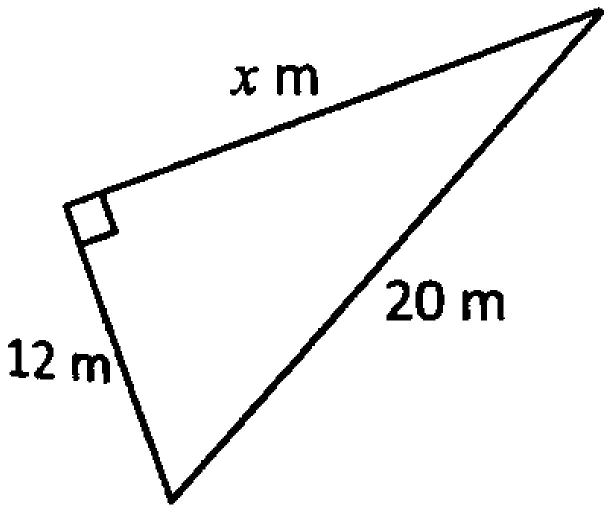
a)



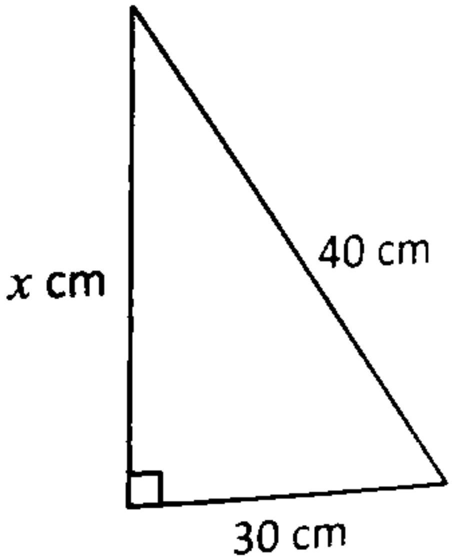
b)



c)

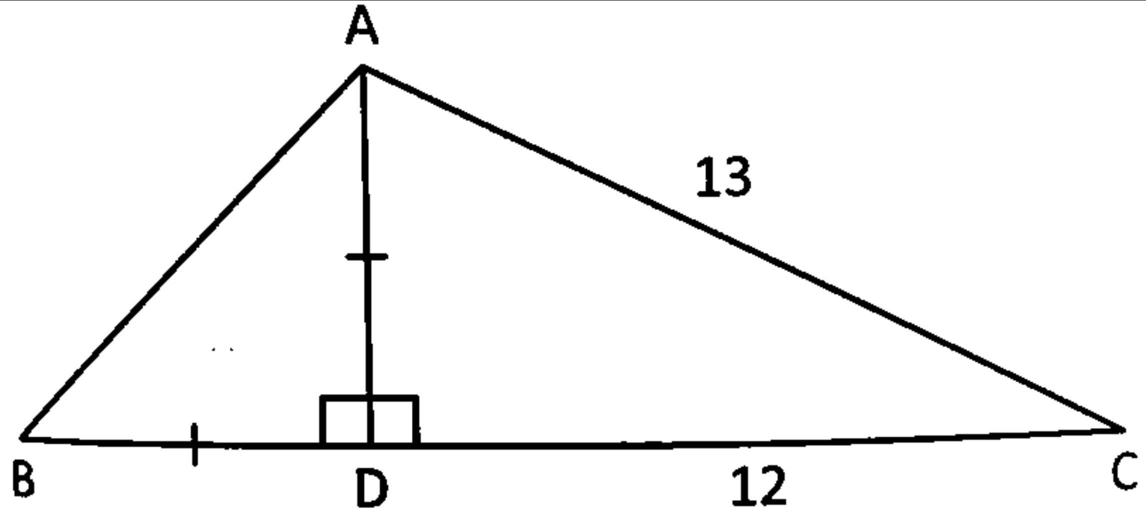


d)



QUESTION 5:

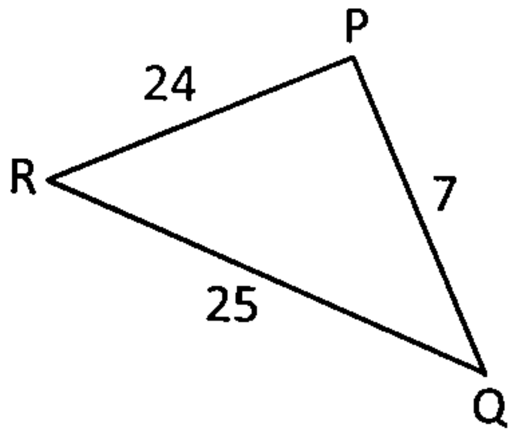
If AC = 13 cm and DC = 12 cm, find the length of AB.



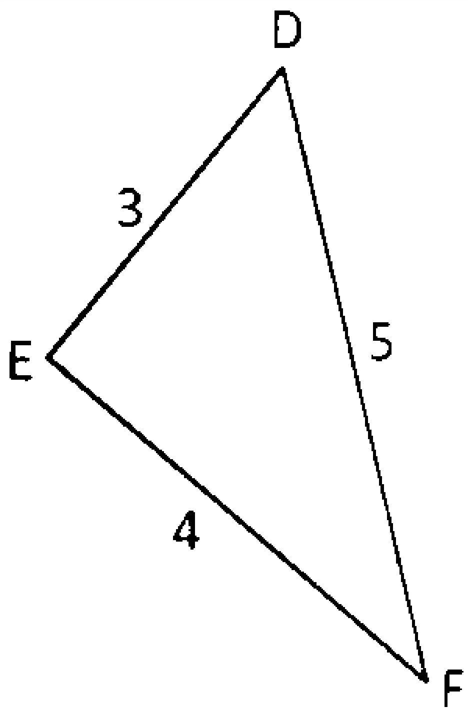
QUESTION 6:

Determine by means of calculation if the following triangles are right-angled.

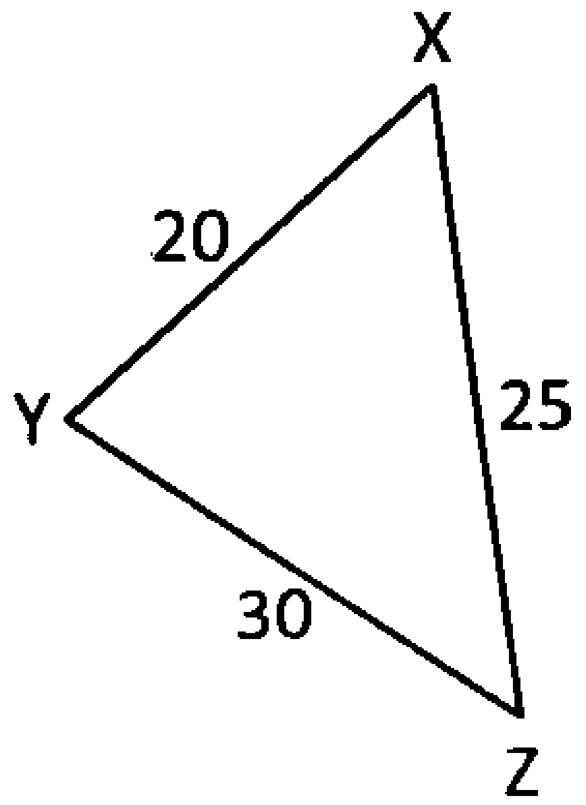
a)



b)



c)



MEMORANDUM: DAY 5:

HOMEWORK:
QUESTION 1:

The theorem of **Pythagoras** states that in a **right-angled** triangle, the square of the **hypotenuse** equals the **sum of the squares** of the other two **sides**.

QUESTION 2:

a) $r^2 = 9^2$
$r^2 = 81$

$p^2 + q^2 = 5^2 + 8^2$
$p^2 + q^2 = 25 + 64$
$= 89$
$\therefore p^2 + q^2 > r^2$
$\therefore$ triangle is an acute-angled triangle.

b) $p^2 = 37^2$
$p^2 = 1\ 369$

$q^2 + r^2 = 35^2 + 12^2$

$p^2 + q^2 = 1\ 225 + 144$
$= 1\ 369$
$\therefore p^2 + q^2 = r^2$
$\therefore$ triangle is a right-angled triangle.

c) $r^2 = 15^2$
$r^2 = 225$

$p^2 + q^2 = 9^2 + 12^2$
$p^2 + q^2 = 81 + 144$
$= 225$
$\therefore p^2 + q^2 = r^2$
$\therefore$ triangle is a right-angled triangle.

QUESTION 3:

a) $x^2 = 3^2 + 4^2$
$x^2 = 9 + 16$
$x^2 = 25$
$x = \sqrt{25}$
$x = 5$ cm

b) $x^2 = 7^2 + 24^2$
$x^2 = 49 + 576$
$x^2 = 625$
$x = \sqrt{625}$
$x = 25$ m

c) $x^2 = 8^2 + 15^2$
$x^2 = 64 + 225$
$x^2 = 289$
$x = \sqrt{289}$
$x = 17$ cm

d) $x^2 = 2^2 + 5^2$
$x^2 = 4 + 25$
$x^2 = 29$
$x = \sqrt{29}$ cm

QUESTION 4:
a) $x^2 = 13^2 - 5^2$
$x^2 = 169 - 25$
$x^2 = 144$
$x = \sqrt{144}$

$x = 12$ cm

b) $x^2 = 50^2 - 30^2$
$x^2 = 2\ 500 - 900$
$x^2 = 1600$
$x = \sqrt{1600}$
$x = 40$ cm

c) $x^2 = 20^2 - 12^2$
$x^2 = 400 - 144$
$x^2 = 256$
$x = \sqrt{256}$
$x = 16$ m

d) $x^2 = 40^2 - 30^2$
$x^2 = 1\ 600 - 900$
$x^2 = 700$
$x = \sqrt{700}$
$x = 10\sqrt{7}$ cm

QUESTION 5:
$AD^2 = AC^2 - DC^2$
$AD^2 = 13^2 - 12^2$
$AD^2 = 169 - 144$
$AD^2 = 25$
$AD = \sqrt{25}$
$AD = 5$

$AD = BD$ ΔABD is an isosceles triangle
$\therefore AB^2 = AD^2 + BD^2$
$AB^2 = 5^2 + 5^2$
$AB^2 = 25 + 25$
$AB^2 = 50$
$AB = \sqrt{50}$
$AB = 5\sqrt{2}$

QUESTION 6:
a) (Length of longest side)$^2 = 25^2$
(Length of longest side)$^2 = 625$

Sum of the squares of the lengths of the other two sides
$= 24^2 + 7^2$
$= 576 + 49$
$= 625$

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $25^2 = 24^2 + 7^2$
$\therefore$ The triangle is right-angled.

b) (Length of longest side)^2 = 5^2
(Length of longest side)^2 = 25

Sum of the squares of the lengths of the other two sides
= $4^2 + 3^2$
= 16 + 9
= 25

(Longest side length)^2 = Sum of squares of other two side lengths
And this can be written as $5^2 = 4^2 + 3^2$
$\therefore$ The triangle is right-angled.

c) (Length of longest side)^2 = 30^2
(Length of longest side)^2 = 900

Sum of the squares of the lengths of the other two sides
= $25^2 + 20^2$
= 625 + 400
= 1 025

(Longest side length)^2 < Sum of squares of other two side lengths
$\therefore$ The triangle is not a right-angled triangle.