<u>Mathematics 8</u>

Math Makes Sense 8

"Basic Chapter Guide Notes"

Unit 1 – Square Roots and the Pythagorean Theorem

- **Square unit** = 

Draw a quadrilateral with 12 square units.
How many different ways can a quadrilateral with 12 units be drawn?

- **Squares**, **Perfect squares**, and **Square Roots**

$1^2 = 1$	$\sqrt{1} = 1$	$9^2 = 9 \times 9 = 81$	$\sqrt{81} = 9$
$2^2 = 2 \times 2 = 4$	$\sqrt{4} = 2$	$10^2 = 10 \times 10 = 100$	$\sqrt{100} = 10$
$3^2 = 3 \times 3 = 9$	$\sqrt{9} = 3$	$11^2 = 11 \times 11 = 121$	$\sqrt{121} = 11$
$4^2 = 4 \times 4 = 16$	$\sqrt{16} = 4$	$12^2 = 12 \times 12 = 144$	$\sqrt{144} = 12$
$5^2 = 5 \times 5 = 25$	$\sqrt{25} = 5$	$13^2 = 13 \times 13 = 169$	$\sqrt{169} = 13$
$6^2 = 6 \times 6 = 36$	$\sqrt{36} = 6$	$14^2 = 14 \times 14 = 196$	$\sqrt{196} = 14$
$7^2 = 7 \times 7 = 49$	$\sqrt{49} = 7$	$15^2 = 15 \times 15 = 225$	$\sqrt{225} = 15$
$8^2 = 8 \times 8 = 64$	$\sqrt{64} = 8$	…	

1, 4, 9, 16, 25,… are called **square numbers** or ***perfect squares***.

* (*The superscript ^{2}, beside the one, indicates square units*)

- The **perimeter** of a square equals four time base (4 x b) or (4 x h).

Example: The perimeter of a square with measures of base 5 cm and height 5cm is 20cm.

4 x 5cm = 20 * *4 represents the number of sides on a square*

5cm + 5cm + 5cm + 5cm = 20cm

- If the **quotient** of an equation equals the **divisor** then the **dividend** is a square number.

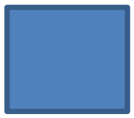
Ex.: 36 ÷ 6 = 6
36 (Dividend) ÷ 6 (Divisor) = 6 (Quotient)

- The square root of 36 is 6; $\sqrt{36} = 6$

- The symbol for square root is $\sqrt{}$

- Finding square root and square on a calculator (function keys)

- Area of a square is length squared; A = l^2



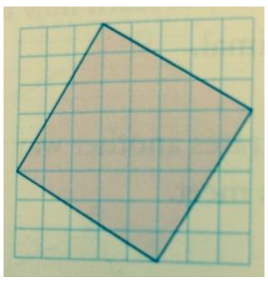
l = 3cm

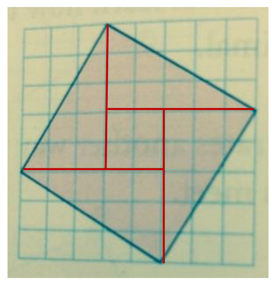
l = 3 cm

A = l^2 = 3^2cm = 3cm x 3cm = 9cm^2 * (*Remember the area is measured in square units.*)

When given the area, the side length is $\sqrt{A}$; l = $\sqrt{A}$

- Find the **area** and **side length** of the square below.





Step 1: Draw the square and triangles
Step 2: Determine the area of the inside square
Step 3: Determine the area of one triangle, then multiple that area by four (4)
Step 4: Add the area of the inside square with the total area of the triangles.
Step 5: Write a statement indicating the total are of the square.

Area of inside Square:	*Area of Triangle*:	*Area of all the triangles*:	*Total Area*:
A = bh	A = $\frac{1}{2}$(bh)	A = 7.5cm^2 x 4	A = 4cm^2 + 28cm^2
b = 2cm	b = 5cm	A = 28cm^2	A = 32cm^2
h = 2cm	h = 3 cm		
A = 2cm x 2cm	A = $\frac{1}{2}$(5cm x 3cm)		
A = 4cm^2	A = $\frac{1}{2}$(15cm)		
	A = 7.5cm^2		

To find the side length of the square, calculate the square root of the area.

$l = \sqrt{32}$cm = 5.65 cm
* the length of the square`s side is 5.65 cm

- The **perimeter** of the square equals the length multiplies by four.

5.65 cm x 4 = 22.6

- Factors and factoring:

  1 x **18** = 18 * (*A factor that occurs twice is only written once in the list of factors*.)
  2 x **9** = 18
  3 x **6** = 18

  The factors of 18 are 1, 2, 3, 6, 9 and 18.

- Numbers arranged from least to greatest are **ascending**

  Ex. 1, 2, 3, 6, 9, and 18

- Numbers arranged from greatest to least are **descending**

  Ex. 18, 9, 6, 3, 2 and 1

- Numbers which read the same forward and backward are **palindromic numbers**.

  Ex. 242; 5005; 63636; …

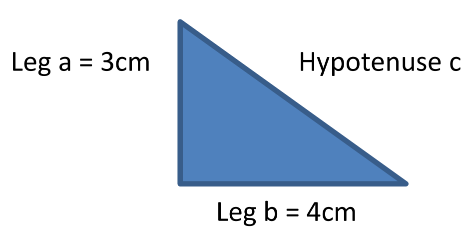
- Finding the area of squares (page 18 and 19)

- Activity: Grid paper and ruler.

- Area of the large square is the area of the four triangles 4(bh/2) + the area of the small inner square l^2.

- The **Pythagorean Theorem**

  Triangles



a is a **leg** (*opposite*)
b is a leg (*adjacent*)
c is the **hypotenuse**

The measurement of c is calculated using the Pythagorean Theorem.

c = $\sqrt{a^2 + b^2}$
c = $\sqrt{3^2 + 4^2}$
c= $\sqrt{9 + 16}$
c = $\sqrt{25}$
c = 5 * The side length of *c* (the hypotenuse) is 5 cm.

Verify:

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

$3^2 + 4^2 = c^2$

$9 + 16 = c^2$

$25 = c^2$

$\sqrt{25} = \sqrt{c^2}$

$5 = c$

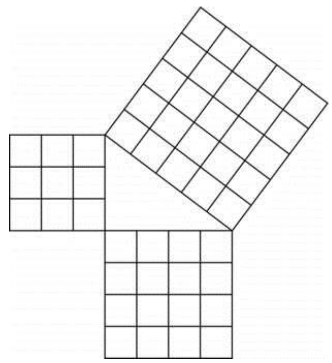
Ex.:

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

$3^2 + 4^2 = c^2$

$9 + 16 = 5^2$

** $c = \sqrt{25}$; or $c = \sqrt{c^2}$



- Find the measurement of ***l***.

$12^2 = l^2 + 9^2$

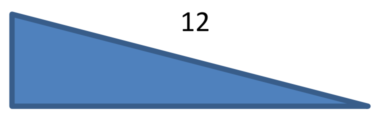
$144 = l^2 + 81$

$144 - 81 = l^2 + 81 - 81$

$63 = l^2$

$\sqrt{63} = \sqrt{l^2}$

$l = 7.9$



or

$l = \sqrt{a^2 - b^2}$

$l = \sqrt{12^2 - 9^2}$

$l = \sqrt{144 - 81}$

$l = \sqrt{63}$

$l = 7.9$

- A set of three whole numbers that satisfies the Pythagorean Theorem is called a **Pythagorean Triple.**

$3^2 + 4^2 = 5^2$