Chapter 3 – Pythagorean Relationship Notes

**Squares and Square roots:**

* **Squared number (x2)** – number multiplied by itself

Ex. 1.52 = 1.5 x1.5 = \_\_\_\_\_\_\_ 42= 4 x 4 = \_\_\_\_\_\_\_\_\_

* **Perfect squares** – squared numbers where whole numbers are multiplied by themselves

Ex. 12 = 1 x1 = \_\_\_\_\_\_, 102 = 10 x 10 = \_\_\_\_\_\_

* **Square root (√ )** – the number that must be multiplied by itself to produce a number

Ex. Square root of 25 = 5 x 5 = \_\_\_\_\_\_\_\_, √36 = \_\_\_\_\_\_\_\_\_\_\_,

\***Square roots** can be thought of as the **side of a square**, where the **squared number is the area of the square**.

 Area of square = 49 cm2  - - SQUARED NUMBER

 One side of the square = \_\_\_\_\_ = SQUARE ROOT

**Estimating square roots:**

-to estimate the root of a number that is **not a perfect square**, use the perfect squares that you know, and decide which it is closer to.

Ex. √90 **Ask yourself**– what squared numbers are close to 90? (100, 81, 64…)

**Think critically** – 90 is almost right in the middle of 100 and 81, so it’s root must be almost right in the middle.

**\*sometimes it helps to use a number line**!

*√100 = 10* and ***√81= 9*** , so *√90 must be close to 9.5*

**Check by squaring**– *9.5 x 9.5 = 90.25* ~ pretty close!

***Estimate the following without a calculator – and show ONE on a number line.***

**Find √144=**

**Estimate √30=**

**Estimate √300=**

**Right Angle Triangles:**

-Triangles that have **one angle that is 90°** are called right angle triangles.

(the box means there is a 90° angle in that corner)

EX. How can we turn this one into a right angle?



 (break it into 2!)

-The side opposite the right angle is called the **hypotenuse**, and it is the longest side of the triangle.

-We need to know **IF triangles are right triangles**, and also **which side is the hypotenuse**, to understand the **Pythagorean theorem.**

**Pythagorean Theorem**

* Developed by a **Greek mathematician (Pythagoras)** to help people find out the lengths of the sides of right angle triangles.
* Says that if you made squares out of the two shorter sides of the right triangle, then added their areas together, you would get the area of the longer side.

a2 + b2 = c2 where **a & b are the shorter sides**, and **c is the hypotenuse**.

***Try it out!***

* Draw a triangle with sides of 3 cm, 4 cm and 5 cm. Make sure there is a right angle!
* Use cm grid paper to cut out squared to fit on both sides and calculate the area.
* Add up the smaller side areas, and see if you get the same answer as the hypotenuse area.

Or Watch: <http://ed.ted.com/on/TKqd74Lp>

Using the Pythagorean Theorem

**a2 + b2 = c2**

**worksto help you find a missing side if you know 2 sides!**

If you know **both short sides**: (EASY)

*Ex.* Short side (a) = 5 cm Other short side (b) = 4 cm Hypotenuse (c) = ?

**a2 + b2 = c2** becomes 52 + 42 = **c2**

*Square your numbers:*

52 + 42 = c2 52 = 25 42 = 16

25 + 16 = c2

41 = c2 (but we need to know c, not c2, so we have to find the square root!)

c = √41 = 6.4 cm (rounded)

If you know a **shorter side and the hypotenuse**: (MORE DIFFICULT)

**Ex.** Short side (a) = 2 m Hypotenuse (c) = 7 m Other short side (b) = ?

**a2 + b2 = c2** becomes 22 + **b 2** = 72

*To solve, you need to* ***get what you know on one side****, and what you don’t on the other (subtract 22 from both sides).*

22**-22** + b 2 = 72**-22**

b 2 = 72-22

b 2 = 49 – 4

b 2 = 45 (but this is SQUARED – we need just the side length! Square root!)

b = √45 = 6.7 m (rounded)

Suggested Group Questions:

P. 85-86 Squares and Square roots:

G – 10, 11, 14, 15, 18

B & R – 4, 10, 11, 14, 15, 18, 19

P. 98-100 Estimating Square roots:

G – 5, 8, 10, 12

B - 5, 8, 10, 12, 15

R - 5, 8, 10, 12, 14, 15

P. 104- 106 Pythagorean Relationships:

G – 3 ,5 ,6 ,9

B - 3 ,5 ,6 ,9, 15

R - 3 ,5 ,6 ,9, 15, and Mathlink in green

P. 109 – 111 Applying the Pyth. Relationship:

G -2, 4, 8

B & R -2, 4, 8, 10, 12

\*\* Use Chapter 3 Review and Practice test in text to help prepare for test – ask teacher for practice test answers if needed.

No project this unit! ☺