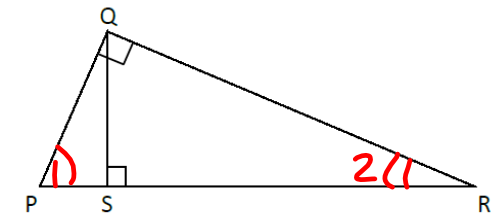
Lesson 8-1L: Pythagorean Theorem
Pythagorean Triplets

Algebra Skills:
- ❑ Simplifying Radicals
- ❑ Arithmetic with Radicals
- ❑ FOIL (double distribution)
- ❑ Solving Quadratic Equations
  - ○ by taking square roots
  - ○ by subtraction prop of eq
  - ○ by factoring

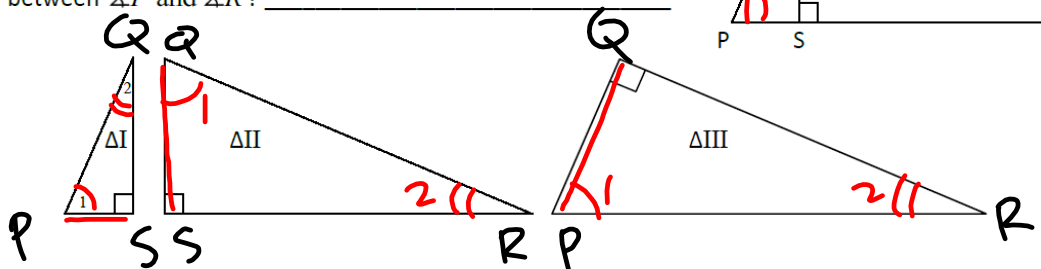
AGENDA:
- Check Bridge to Unit 8 (will review later)
- Notes with Applications and Guided Practice

HOMEWORK:
- Complete Problem Set in Notes
- CR#7 is Due Monday 3/20

Right Triangle Investigation – using similarity and proportions from Unit 7

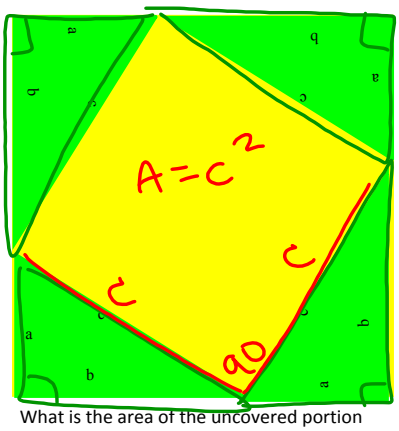


1. Since you know $\measuredangle PQR$ is a right angle, what is the relationship between $\measuredangle P$ and $\measuredangle R$? _____

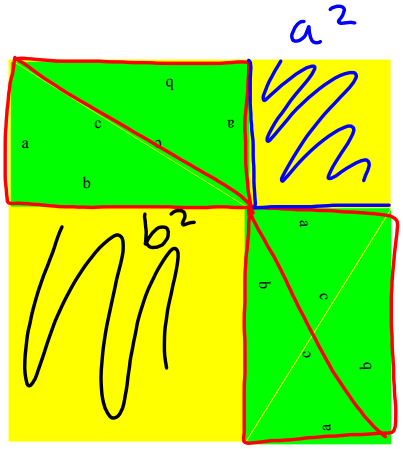


2. Label the vertices of the redrawn triangles ΔPSQ (I), ΔQSR (II), and ΔPQR (III).
3. Label all the acute angles in ΔII and ΔIII that are congruent to $\measuredangle QPS$ as 1's.
4. Label all the acute angles in ΔII and ΔIII that are congruent to $\measuredangle PQS$ as 2's.
5. Color the short sides connecting angles labeled as 1's to right angles RED.

Why does the Pythagorean Theorem work? Prove it!



What is the area of the uncovered portion of the main square?



Now what is the area of the uncovered portions of the main square?

Bring it together:
Since you didn't change the area of the four triangles or the overall area of the main square, what does this mean about the uncovered areas you found in part 1 and part 2?

_____.

How does this create an equation that becomes a formula? _____.

TV problem: A customer wants to buy a television set to fit into an entertainment center with an opening 2.5 ft tall and 3 feet wide. The height and width of the television are not printed on the box, but the screen is 41", measured diagonally from edge to edge, and the aspect ratio is 5:4. Will it fit?

5x : 4x

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

$(5x)^2+(4x)^2=41^2$

$25x^2+16x^2=41^2$

$41x^2=41^2$

$\frac{41x^2}{41}=\frac{41\cdot 41}{41}$

$x^2=41$

$x=\pm\sqrt{41}$

$x=6.4031$

2.5 FT = 30 IN

3 FT = 36 IN

$4x=4\sqrt{41}=25.6124$ IN

$5x=5\sqrt{41}=32.0156$ IN

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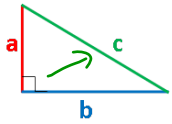
Pythagorean Theorem: In a right triangle, the sum of the squared lengths of the legs is equal to the square of the hypotenuse.



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

Example 1: Find the value of the variable and all side the side lengths in each triangle

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

$5^2 + (x-1)^2 = x^2$

$25 + (x-1)(x-1) = x^2$

$25 + x^2 + 1 - 1x - 1x = x^2$

$x^2 - 2x + 26 = x^2$

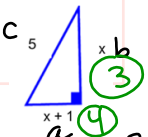
$-x^2 \quad -x^2$

$-2x + 26 = 0$

$+2x \quad +2x$

$26 = 2x$

$13 = x$



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

$x^2 + (x+1)^2 = 5^2$

$x^2 + x^2 + 2x + 1 = 25$

$\frac{2x^2}{2} + \frac{2x}{2} - \frac{24}{2} = \frac{0}{2}$

$x^2 + 1x - 12 = 0$

$(x+4)(x-3) = 0$

$x + 4 = 0 \quad | \quad x - 3 = 0$

$x = -4 \quad | \quad x = 3$

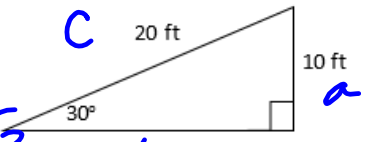
WON'T GIVE + SIDE LENGTH

$(x+1)(x+1)$

$x^2 + 1x + 1x + 1$

$x^2 + 2x + 1$

Example 2 (Application): A skateboard ramp is built at a 30° angle such that the ramp is 20 feet long for the rider and has a height of 10 feet. How long, exactly, is the base along the ground?



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

$10^2 + x^2 = 20^2$

$100 + x^2 = 400$

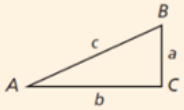
$x^2 = 300$

$x = \pm\sqrt{300}$

$x = \sqrt{100}\sqrt{3}$ (10, X)

$x = 10\sqrt{3}$ FT (b)

Theorems 5-7-1 Converse of the Pythagorean Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If the sum of the squares of the lengths of two sides of a triangle is equal to the square of the length of the third side, then the triangle is a right triangle.	 $a^2 + b^2 = c^2$	$\triangle ABC$ is a right triangle.

Example 3: Determining if a triangle is a right triangle

A sail has the dimensions as follows: the base is 10 feet, the height is 24 feet, and the back side (hypotenuse) is 26 feet.

a) Verify that the sail is a right triangle.

$a^2 + b^2 \stackrel{?}{=} c^2$

$10^2 + 24^2 \stackrel{?}{=} 26^2$

$100 + 576 = 676$ ✓

$676 = 676$

YES, RT △ SINCE $a^2+b^2=c^2$

b) Is this triangle similar to a right triangle with sides 5-12-13? How did you decide?

10-24-26

$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$ SSS ~

c) What would you guess the hypotenuse is for a right triangle with legs 15 and 36? Why?

5-12-13

15-36-39 $k=3$

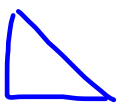
$k=3$ $k=3$

PYTHAGOREAN TRIPLES

A set of whole numbers that satisfy the Pythagorean Theorem.

**A Pythagorean triple in which the greatest common factor the numbers share is only 1 is called a primitive triple. Otherwise, look for a scale factor.*

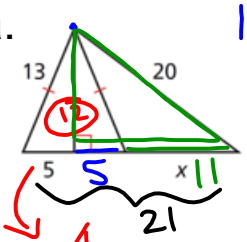
Common Pythagorean Triples
$\{3,4,5\}\{5,12,13\}\{8,15,17\}\{7,24,25\}$



Example 4: Verifying & Identifying Pythagorean Triples

Solve for x and determine the side lengths and perimeter of the largest triangle

a.



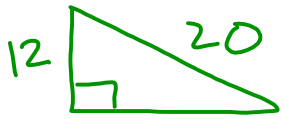
ISOS △ ALT FROM VERTEX ∠ = ⊥ BIS BASE

{5-12-13} TRIPLET

$5^2 + y^2 = 13^2$

$P = 13 + 20 + (5+5+11)$

$P = 54$



$a^2 + 12^2 = 20^2$

OR {3-4-5}

12 · a · 20

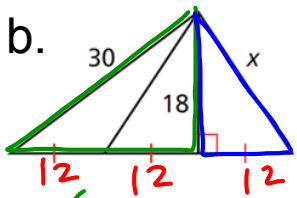
$k = 4$ $k = 4$

$a = 4(4)$

$a = 16$

$x = 11$

b.

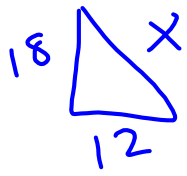


{3-4-5}

{18 · a · 30}

$k = 6$ $k = 6$

$a = 6(4) = 24$



~~{3-4-5}~~

~~{5-12-13}~~

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

$12^2 + 18^2 = x^2$

$144 + 324 = x^2$

$\pm\sqrt{468} = \sqrt{x^2}$

$\sqrt{4}\sqrt{117} = x$

$2\sqrt{9}\sqrt{13} = x$

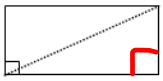
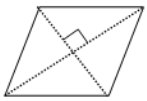
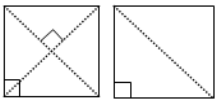
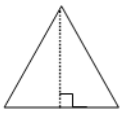
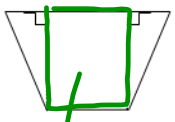
$2 \cdot 3\sqrt{13} = x$

$6\sqrt{13} = x$

$P = 30 + 6\sqrt{13} + 36$

$P = 66 + 6\sqrt{13}$

APPLYING THE PYTHAGOREAN THEOREM TO DIAGONALS AND ALTITUDES

RECTANGLE	RHOMBUS	SQUARE	TRIANGLE	TRAPEZOID
Rt. △'s are formed by diagonals 	Diagonals are ⊥ forming Rt. △'s 	Rt. △'s are formed by diagonals 	Altitudes are ⊥ to base forming Rt. △'s 	Altitudes are ⊥ to bases forming Rt. △'s  RECT

PRACTICE: Draw a picture to justify your work. Show all work.

 = Keep this problem in mind during the unit...

Attachments

Bridge to 8.docx