Geometry: *Hutschenreuter* Name KEY

Section 7.2: Use the Converse of they Pythagorean Theorem

Essential Question:
How can you use the sides of a triangle to determine if it is a right, obtuse, or actue triangle?

PREVIOUS VOCAB:

Acute triangle — A triangle with three acute angles

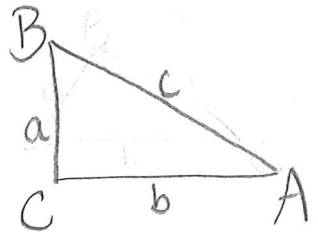
Obtuse triangle — A triangle with one obtuse angle

Theorem 7.2: Converse of the Pythagorean Theorem

If the square of the longest side of a triangle is equal to the sum of the squares of the other two sides then the triangle is a right triangle.

* Note: hypotenuse is the longest side ∴ hyp = c

Given

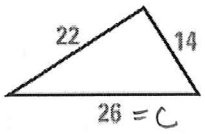


If $a^2+b^2=c^2$, then $\triangle ABC$ is a right triangle.

EXAMPLES:

A1. Tell whether the given triangle is a right triangle.

a.



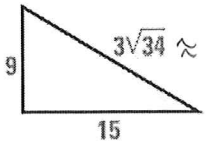
(longest)

$14^2+22^2 \stackrel{?}{=} 26^2$

$680 \neq 676$

Not a rt. $\triangle$

b.



$9^2+15^2 \stackrel{?}{=} (3\sqrt{34})^2$

$81+225 \quad 3^2 \cdot 34$

$306 \stackrel{?}{=} 9 \cdot 34$

$306 = 306$

yes

Rt. $\triangle$

A2. Tell whether the triangle with given side lengths is a right triangle.

a. $4, 8, 4\sqrt{3} \approx 6.9$ (c)

$4^2+(4\sqrt{3})^2 \stackrel{?}{=} 8^2$

$16+16\cdot 3 = 64$

$16+48 = 64$

$64 = 64$

yes, Rt $\triangle$

b. 14, 10, 11 (c)

$10^2+11^2 \stackrel{?}{=} 14^2$

$100+121$

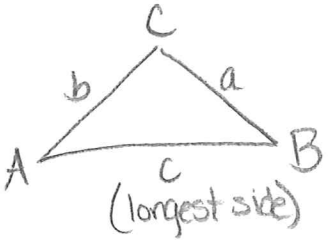
$221 \neq 196$

Not a Rt. $\triangle$

Theorem 7.3: Pythagorean Inequality-Acute

If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the other 2 sides, then the triangle is an acute triangle.

Given

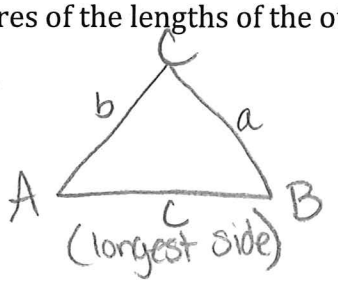


If $c^2 < a^2+b^2$, then $\triangle ABC$ is an acute triangle.

Theorem 7.4: Pythagorean Inequality-Obtuse

If the square of the length of the longest side of a triangle is greater than the sum of the squares of the lengths of the other 2 sides, then the triangle is an obtuse triangle.

Given



If $c^2 > a^2 + b^2$, then $\triangle ABC$ is an obtuse triangle.

A3. Classify the triangles with the sides as *right*, *acute*, or *obtuse*.

a. 4.3, 5.2, 6.1 (C)

$6.1^2 \boxed{?} 4.3^2 + 5.2^2$

$37.21 \boxed{<} 45.53$

c^2 is less than

$\triangle$ is acute

b. 12, 10, $\sqrt{13} \approx 3.6$ (C)

$12^2 \boxed{?} 10^2 + (\sqrt{13})^2$

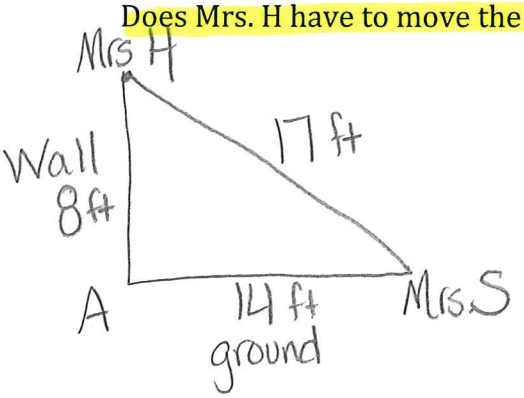
$144 \boxed{\ } 100 + 13$

$144 \boxed{>} 113$

c^2 greater than

$\triangle$ is obtuse

A4. Mrs. H is framing a room in her basement. She has her trusty sidekick Mrs. S helping her put in an 8-foot high wall. The framed wall must be perpendicular to the floor. Mrs. H has a 17-foot string and attaches it to the very top of the wall. Mrs. S holds the end of the string along a tape measure on the ground at 14 feet, while Mrs. H positions the top of the wall. Does Mrs. H have to move the top of the wall further away or closer to Mrs. S?



$17^2 \boxed{?} 8^2 + 14^2$

$289 \boxed{>} 260$

$\angle A$ is greater so it is an obtuse $\angle$ so Mrs H needs to make the angle smaller by moving the top of the wall closer to Mrs. S.

Section 7.2 Summary:

Given lengths a, b, c and c being the longest side:

options

1. If $c^2 = a^2 + b^2$ then $\triangle ABC$ is a rt $\triangle$
2. If $c^2 < a^2 + b^2$ then $\triangle ABC$ is an acute $\triangle$
3. If $c^2 > a^2 + b^2$ then $\triangle ABC$ is an obtuse $\triangle$