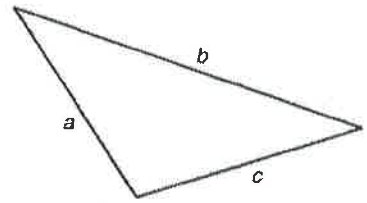
Geometry A | Name : Key
7.2: Converse of Pythagorean Theorem Notes | Date : ______ Period : ____

Today's Learning Targets:

- I can determine if side lengths form a triangle.
- I can find possible side lengths of a triangle
- I can classify a triangle as acute, obtuse, or right given side lengths.

| Theorem | Example |
|---|---|
| **Triangle Inequality Theorem**<br>The sum of any two sides of a triangle is greater than the third side length. |   $a + b > c$<br>$b + c > a$<br>$c + a > b$ |

**Example 1:** *Find possible side lengths.*

The lengths of two sides of a triangle are given. Describe the possible lengths of the third side.

a) 14 and 10 , x (a, b, c)

$a+b>c$ | ~~$a+c>b$~~ | $b+c>a$
$14+10>x$ | ~~$14+x>10$~~ | $10+x>14$
$24>x$ | ~~$x>-4$~~ | $x>4$

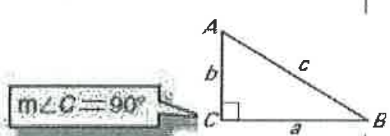
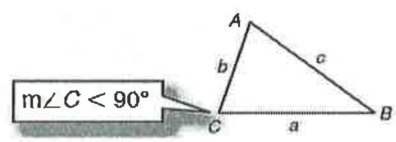
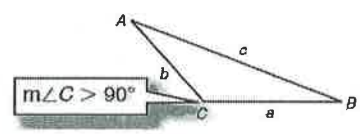
not possible
no neg. side lengths

$\boxed{4<x<24}$

b) 23 and 17 , x (a, b, c)

$a+b>c$ | ~~$a+c>b$~~ | $b+c>a$
$23+17>c$ | ~~$23+x>17$~~ | $17+x>23$
$40>c$ | ~~$x>-6$~~ | $x>6$

$\boxed{6<x<40}$

| Converse of Pythagorean Theorem | | |
|---|---|---|
| Given three sides of a triangle, *a, b,* and *c*, where *c* is the longest side, if $c^2 = a^2 + b^2$, then the triangle is a right triangle.<br>  | Given three sides of a triangle, *a, b,* and *c*, where *c* is the longest side, if $c^2 < a^2 + b^2$, then the triangle is an acute triangle.<br>  | Given three sides of a triangle, *a, b,* and *c*, where *c* is the longest side, if $c^2 > a^2 + b^2$, then the triangle is an obtuse triangle.<br>  |

**Example 2:** *Classify triangles, if possible.*

Determine if the given side lengths can form a triangle. If so, would the triangle be acute, right, or obtuse?

a) 4, 7, 9 (a b c ← c b/c biggest #)

$4+7 \overset{?}{>} 9$ ✓
$7+9 \overset{?}{>} 4$ ✓
$4+9 \overset{?}{>} 7$ ✓

Yes, it is a Δ

$c^2 \_ a^2+b^2$

$9^2 \_ 4^2+7^2$

$81 \_ 16+49$

$81 \geq 65$

since $c^2 > a^2+b^2$
the Δ is $\boxed{\text{obtuse}}$

b) 10, 13, 16 (a b c)

$10+13 \overset{?}{>} 16$ ✓ Yes, it is a Δ
$10+16 \overset{?}{>} 13$ ✓
$13+16 \overset{?}{>} 10$ ✓

$c^2 \_ a^2+b^2$

$16^2 \_ 10^2+13^2$

$256 \_ 100+169$

$256 \leq 269$

since $c^2<a^2+b^2$,
the Δ is $\boxed{\text{acute}}$

c) 5, 14, 20 (a b c)

$5+14 \overset{?}{>} 20$
$19>20$ ← no, 19 is not greater than 20

so it is $\boxed{\text{not a Δ}}$

d) $3, 5, \sqrt{34}$ (a b c) $\approx 5.8$

$3+5 \overset{?}{>} 5.8$ ✓
$5+5.8 \overset{?}{>} 3$ ✓
$3+5.8 \overset{?}{>} 5$ ✓

Yes, it is a Δ

$c^2 \_ a^2+b^2$

$(\sqrt{34})^2 \_ 3^2+5^2$

$34 \_ 9+25$

$34 = 34$

since $c^2=a^2+b^2$,
the Δ is $\boxed{\text{right}}$