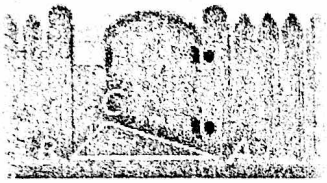
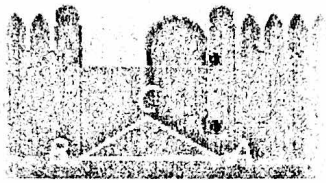
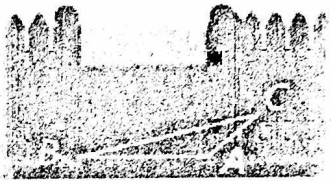
Name: Date: Period: 1

Hinge Theorem

Lesson Objective SWBAT apply the Hinge Theorem to determine larger sides/∠s in 2 Δs.

Imagine a gate between the fence posts A and B that has hinges at A and swings open at B.

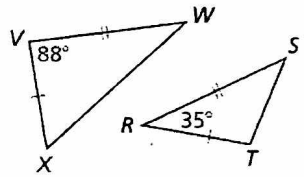
As the gate swings open, you can think of ΔABC, with side $\overline{AC}$ formed by the gate itself, side $\overline{AB}$ representing the distance between the fence posts, and side $\overline{BC}$ representing the opening between post B and the outer edge of the gate.

Notice that as the gate opens wider, both the measure of $\angle A$ and the distance BC increase. This suggests the **Hinge Theorem**

Hinge Theorem

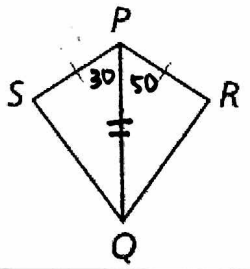
If two sides of one Δ are congruent to two sides of another Δ, and the included angle of the first Δ is larger than the included angle of the second Δ, then the third side of the first Δ is greater than the third side of the second Δ.



m∠V > m∠R, so XW > ST

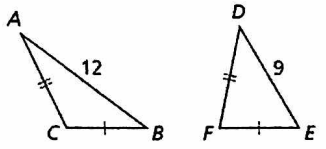
Example: 50° 30°

1. If $PR = PS$ and $m\angle QPR > m\angle QPS$, which is longer: SQ or RQ?



Converse of the Hinge Theorem

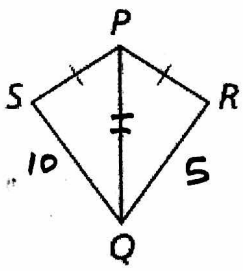
If two sides of one Δ are congruent to two sides of another Δ, and the third side of the first Δ is longer than the third side of the second Δ, then the included angle of the first Δ is greater than the included angle of the second Δ.



AB > DE, so m∠C > m∠F

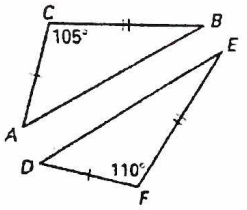
Examples: 5 10

2. If $PR = PS$ and $RQ < SQ$, which is larger: $\angle RPQ$ or $\angle SPQ$?

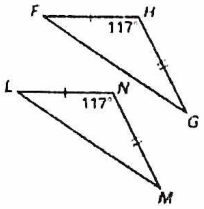


3. Complete the statement with <, >, or =

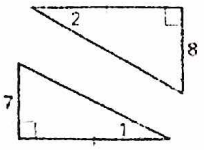
1. AB **<** DE



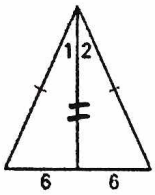
2. FG **=** LM



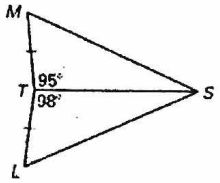
3. $m\angle 1$ **<** $m\angle 2$



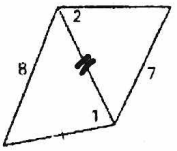
4. $m\angle 1$ **=** $m\angle 2$



5. MS **<** LS

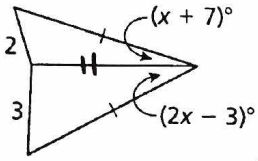


6. $m\angle 1$ **>** $m\angle 2$



4. Write and solve an inequality to solve for the possible values of x.

a.



$2x-3 > x+7$

$x > 10$

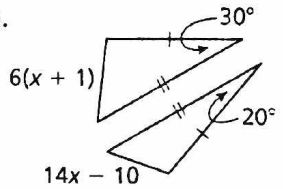
$2x-3 < 180$

$2x < 183$

$x < 91.5$

$10 < x < 91.5$

b.



$6(x+1) > 14x-10$

$6x+6 > 14x-10$

$16 > 8x$

$2 > x$

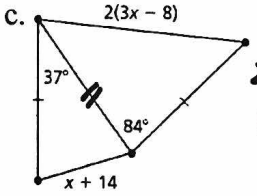
$14x-10 > 0$

$14x > 10$

$x > \frac{5}{7}$

$\frac{5}{7} < x < 2$

c.



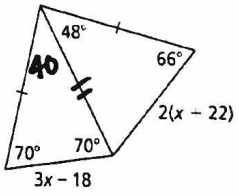
$2(3x-8) > x+14$

$6x-16 > x+14$

$5x > 30$

$x > 6$

d.



$2(x+22) > 3x-18$

$2x+44 > 3x-18$

$62 > x$

$3x-18 > 0$

$3x > 18$

$x > 6$

$6 < x < 62$

5. Two groups of bikers leave the same camp heading in opposite directions. Group A starts east for 2 miles, then turns 45° north and travels for another 1.2 miles. Group B starts west for 2 miles, then turns 30° south for another 1.2 miles. Which group is farther from camp? Draw a diagram and explain.