AAT Name _____

3-7 Compositions of Functions Date _____ **A#9**

Goal: Make composite functions.

Warm Up:

Questions

1. Is the father of your mother the same as the mother of your father? Explain.

2. Is the sum of the squares of 4 and 5 the same as the square of the sum of 4 and 5? Show work.

Activity: Math Puzzle

a. Using numbers, write down the day _____ and month _____ of your birthdate
b. Double the day _____
c. Multiply by ten _____
d. Add 73 _____
e. Multiply by 5 _____
f. Add the number of the month _____
g. Subtract 365 _____

What do you notice about the final answer? Why will it always work?

Each step can be called a function, but if you put it all together as *one* function, you get the same result. This is called the _____ _____.

Definition of Composite Function

Suppose f and g are functions. The _____ of g with f, written _____ is the function defined by

$$(g \circ f)(x) = g(f(x)).$$

The domain of $g \circ f$ is the set of values of x in the domain of f for which $f(x)$ is in the domain of g.

Questions	**Composition and Commutative Property**

Example 1: Let f and g be defined by $f(x)=2x^2+3x$ and $g(x)=x-7$.
Evaluate.

a. $(f\circ g)(-2)$ b. $(g\circ f)(-2)$

Conclusion:

Practice 1: Let f and g be defined by $f(x)=x^2$ and $g(x)=\frac{1}{3x+1}$.
Evaluate.

a. $(f\circ g)(4)$ b. $(g\circ f)(4)$ c. $f(g(4))$

Example 2: Let f and g be defined by $f(x)=2x^2+3x$ and $g(x)=x-7$.

a. Derive a formula for $(f\circ g)(x)$.

b. Give a simplified formula for $(g\circ f)(x)$

c. Verify that $f\circ g\neq g\circ f$ by graphing.

Practice 2: Let *f* and *g* be defined by $f(x)=x^2$ and $g(x)=\frac{1}{3x+1}$. a. Derive a formula for $(f\circ g)(x)$. b. Give a simplified formula for $(g\circ f)(x)$ c. Verify that $f\circ g \neq g\circ f$ by graphing. **Finding the Domain of a Composite Function** "The domain of $g\circ f$ is the set of values of *x* in the domain of *f* for which $f(x)$ is in the domain of *g*. " What? Example 3: Let *f* and *g* be defined by $f(m)=\sqrt{m}$ and $g(m)=\frac{2}{m-3}$. Find the domain of $g\circ f$. Then find the domain of $f\circ g$.	**Questions**

Questions

Practice 3: Let f and g be defined by $f(x)=x^2$ and $g(x)=\frac{1}{3x+1}$. Find the domain of $g\circ f$. Then find the domain of $f\circ g$.

Composition of Transformations

Because transformations are functions, they can be composed and they are not commutative.

Example 4: Let $S:(x,y)\to(2x,y)$ and $T:(x,y)\to(x+4,y-3)$.

a. Describe S and T in words.

b. Write a formula for $(T\circ S)(x,y)$ and describe in words.

c. Write a formula for $(S\circ T)(x,y)$ and describe in words.

Summary: