Function Connection Lab

Are the outputs combined or connected?

A1P.AF.E.17 "Combine different types of standard functions to write, evaluate, and interpret functions in context. Limit to linear, quadratic, exponential, and absolute value functions. a..."

NAME _____ DATE _____

ARITHMETIC OPERATIONS

Find an output from each function, then add, subtract, multiply, or divide the outputs.

Plant heights: $a(t)=2t+1$ and $b(t)=t^2$. At $t=3$, $a(3)+b(3)=7+9=16$.

FUNCTION COMPOSITION

Find the output of one function, then use that output as the input of another function.

Photo editing: $d(x)=2x$ and $e(x)=|x-5|$. First $d(4)=8$, then $e(d(4))=e(8)=3$.

1 SORT

8 items

Circle OPERATIONS or COMPOSE for each numbered item, then choose one item from each category and explain how you knew.

1.	Event costs (dollars): $P(n)=4n+6$, $Q(n)=n^2$; $P(2)+Q(2)$	OPERATIONS	COMPOSE
2.	Savings (dollars): $A(t)=50+5t$, $B(t)=2^t$; $A(3)-B(3)$	OPERATIONS	COMPOSE
3.	Temperature: $F(c)=9c/5+32$ °F, $D(f)=\|f-32\|$ °F; $D(F(10))$	OPERATIONS	COMPOSE
4.	Banner: $W(x)=x+2$ cm, $H(x)=\|x-3\|$ cm; $W(4)\times H(4)$	OPERATIONS	COMPOSE
5.	Delivery: $W(n)=n^2$ kg, $D(w)=2w+1$ dollars; $D(W(3))$	OPERATIONS	COMPOSE
6.	Signal: $V(t)=2^t$ volts, $E(v)=\|v-5\|$ volts; $E(V(2))$	OPERATIONS	COMPOSE
7.	Square plot: $S(x)=x+3$ m, $A(s)=s^2$ m²; $A(S(2))$	OPERATIONS	COMPOSE
8.	Map distances (miles): $A(x)=2x+1$, $B(x)=\|x-3\|$; $A(4)+B(4)$	OPERATIONS	COMPOSE

2 PROVE IT

Explain your thinking

Choose one item from each category and explain how you knew.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new real-world example for each category using two different types of functions, and evaluate each example at an input you choose.

OPERATIONS _____

COMPOSE _____

CHALLENGE

Choose one composition item, rewrite the combined function as a single expression in its original input, then evaluate it at the input shown and explain the result with units.

ANSWER KEY

Function Connection Lab

HIGH SCHOOL · A1P.AF.E.17

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Event costs (dollars): $P(n)=4n+6$, $Q(n)=n^2$; $P(2)+Q(2)$	**OPERATIONS**	Adds two cost outputs: 14+4=18 dollars.
2	Savings (dollars): $A(t)=50+5t$, $B(t)=2^t$; $A(3)-B(3)$	**OPERATIONS**	Subtracts two account balances: 65-8=57 dollars.
3	Temperature: $F(c)=9c/5+32$ °F, $D(f)=\lvert f-32\rvert$ °F; $D(F(10))$	**COMPOSE**	Uses $F(10)=50$ as the input to D, giving 18 °F from freezing.
4	Banner: $W(x)=x+2$ cm, $H(x)=\lvert x-3\rvert$ cm; $W(4)\times H(4)$	**OPERATIONS**	Multiplies the width and height outputs: $6\times1=6$ cm².
5	Delivery: $W(n)=n^2$ kg, $D(w)=2w+1$ dollars; $D(W(3))$	**COMPOSE**	Uses $W(3)=9$ as the input to D, giving a cost of 19 dollars.
6	Signal: $V(t)=2^t$ volts, $E(v)=\lvert v-5\rvert$ volts; $E(V(2))$	**COMPOSE**	Uses $V(2)=4$ as the input to E, giving a difference of 1 volt.
7	Square plot: $S(x)=x+3$ m, $A(s)=s^2$ m²; $A(S(2))$	**COMPOSE**	Uses $S(2)=5$ as the input to A, giving an area of 25 m².
8	Map distances (miles): $A(x)=2x+1$, $B(x)=\lvert x-3\rvert$; $A(4)+B(4)$	**OPERATIONS**	Adds two distance outputs: 9+1=10 miles.

PART 2 · PROVE IT

Task: Choose one item from each category and explain how you knew.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **OPERATIONS**: Aquarium fees (dollars): $a(n)=3n+2$ and $b(n)=n^2$; $a(2)+b(2)=8+4=12$ dollars.
- **COMPOSE**: Shipping: $M(n)=2n+1$ kg and $C(w)=w^2$ dollars; $C(M(2))=C(5)=25$ dollars.

Challenge: Item 3: $D(F(c))=\lvert 9c/5\rvert$ °F. At $c=10$, $D(F(10))=18$ °F, so 10 °C is 18 °F above freezing.

For Part 2, an explanation for item 1 should say that it adds two outputs; an explanation for item 3 should say that F(10) becomes D's input. Other pairs are valid if they identify how the functions connect.