Name _____ Date _____

Average Rate of Change: Find the Error

Directions: Each question shows a student's work finding an average rate of change over a stated interval: the change in output divided by the change in input, with both changes subtracted in the same order. Exactly one step is wrong, and every step after it follows from the wrong one.

Values of the function f for $x = 0$ to 4

x	f(x)
0	3
1	5
2	11
3	21
4	35

1. Using the table, Ava found the average rate of change of f from $x = 1$ to $x = 4$. One step is wrong.

1. $f(4) = 35$ and $f(1) = 5$
2. Average rate $= (35 - 5)/(1 - 4)$
3. Average rate $= 30/(-3) = -10$

Which step is wrong?

A. Simplifying $30/(-3)$ to -10

B. Writing the average rate as $(35 - 5)/(1 - 4)$

C. Reading $f(4) = 35$ and $f(1) = 5$ from the table

2. Ben found the average rate of change of $f(x) = x^2 + 2x$ from $x = 2$ to $x = 5$. His work has one error.

1. $f(2) = 2^2 + 2(2) = 8$
2. $f(5) = 5^2 + 2(5) = 35$
3. Average rate $= (5 - 2)/(35 - 8)$
4. Average rate $= 3/27 = 1/9$

Which step contains the error?

A. Simplifying $3/27$ to $1/9$

B. Writing the average rate as $(5 - 2)/(35 - 8)$

C. Finding $f(5) = 35$

D. Finding $f(2) = 8$

A car's distance from home; time goes up by 1 hour in each row

Time t (hours)	Distance d (miles)
0	0

Time t (hours)	Distance d (miles)
1	45
2	110
3	165

3. Cora used the table to find the car's average rate of change of distance from $t = 1$ to $t = 3$ hours. One step is wrong.

1. At $t = 3$, $d = 165$
2. At $t = 1$, $d = 1$
3. Average rate $= (165 - 1)/(3 - 1) = 164/2 = 82$ miles per hour

Where does her work first go wrong?

A. Reading $d = 165$ at $t = 3$

B. Computing $(165 - 1)/(3 - 1) = 82$ miles per hour

C. Reading $d = 1$ at $t = 1$

4. Dev found the average rate of change of $f(x) = x^2 + 1$ from $x = 1$ to $x = 3$, but one step is wrong.

1. $f(1) = 1^2 + 1 = 2$
2. $f(3) = 3^2 + 1 = 10$
3. Average rate $= (2 + 10)/2$
4. Average rate $= 12/2 = 6$

Which step is wrong?

A. Finding $f(1) = 2$

B. Writing the average rate as $(2 + 10)/2$

C. Finding $f(3) = 10$

D. Simplifying $12/2$ to 6

The temperature after noon; time goes up by 2 hours in each row

Hours after noon, h	Temperature T (°F)
0	78
2	74
4	66
6	60

5. Eli found the average rate of change of the temperature from $h = 2$ to $h = 6$ hours after noon. His work has one error.

1. $T = 60$ at $h = 6$
2. $T = 78$ at $h = 2$
3. Average rate $= (60 - 78)/(6 - 2) = -18/4 = -4.5$ degrees per hour

Where does his work first go wrong?

A. Reading $T = 78$ at $h = 2$

B. Reading $T = 60$ at $h = 6$

C. Computing $(60 - 78)/(6 - 2) = -4.5$ degrees per hour

6. Fay found the average rate of change of $f(x) = -x^2 + 8x$ from $x = 1$ to $x = 4$, and her work has one error.

1. $f(1) = -1 + 8 = 7$
2. $f(4) = -16 + 32 = 16$
3. Average rate $= 16 - 7 = 9$

What is the correct average rate of change from $x = 1$ to $x = 4$?

A. $1/3$ B. 3 C. 11.5
D. -3 E. 9

Water in a tank; time goes up by 2 minutes in each row

Time t (minutes)	**Volume V (gallons)**
0	10
2	14
4	22
6	34
8	50

7. Gus found the average rate of change of the volume from $t = 2$ to $t = 8$ minutes, but his work has one error.

1. $V = 14$ at $t = 2$ and $V = 50$ at $t = 8$
2. The change in volume is $50 - 14 = 36$ gallons.
3. There are 3 steps between those rows, so the average rate is $36/3 = 12$ gallons per minute.

Correct the error. What is the average rate of change from $t = 2$ to $t = 8$?

_____ gallons per minute

App downloads by month; the months go up by 1 in each row

Month m	**Downloads D (thousands)**
1	8
2	10
3	15
4	23

8. Ken described the average rate of change of downloads from $m = 1$ to $m = 4$. One step in his work is wrong.

1. $D = 8$ at $m = 1$ and $D = 23$ at $m = 4$
2. Average rate $= (23 - 8)/(4 - 1) = 15/3 = 5$ thousand downloads per month
3. So downloads grew by exactly 5 thousand in each of those months.

Which step is wrong?

A. Saying downloads grew by exactly 5 thousand in each of those months

B. Reading $D = 8$ at $m = 1$ and $D = 23$ at $m = 4$

C. Computing $(23 - 8)/(4 - 1) = 5$ thousand downloads per month