Name _____ Date _____

Linear or Exponential? Telling Growth Apart from a Table

Directions: In every table here, the inputs go up by equal steps, and each table says how big the steps are. Compare the differences and the ratios of the outputs to tell linear patterns from exponential ones.

Four functions; x goes up by 1 in each row

x	P(x)	Q(x)	R(x)	S(x)
0	2	3	40	1
1	6	6	34	2
2	18	9	28	5
3	54	12	22	10

1. The table shows four functions, P, Q, R and S, at the same x values, which go up by 1 in each row. Match each function to the pattern in its rows.

Write the letter of the matching answer on each line.

1. _____ Function P
2. _____ Function Q
3. _____ Function R
4. _____ Function S

A. Exponential: multiplied by 2 each step
B. Linear: goes up by 3 each step
C. Linear: goes down by 6 each step
D. Neither linear nor exponential
E. Exponential: multiplied by 3 each step
F. Linear: goes up by 4 each step

x goes up by 1 in each row

x	y
0	4
1	6
2	9
3	13.5

2. In this table, x goes up by 1 in each row. Mai says the rows fit a linear function because y goes up every time. Which statement explains why she is wrong?

A. The x values would have to go up by 2 each time for the rows to be linear.
B. A linear function can never have outputs that go up.
C. The differences 2, 3 and 4.5 are not equal, while each output is 1.5 times the one before, so the rows fit an exponential pattern.
D. The outputs would have to go up by exactly 1 each time for the rows to be linear.

Milligrams of a substance left in a sample; time goes up by 2 hours in each row

Time (hours)	Amount left (milligrams)
0	800
2	400
4	200
6	100

3. In this table, the time goes up by 2 hours in each row. By what factor is the amount multiplied each time the time goes up by 2 hours? Give the factor as a decimal.

_____

4. Match each situation to the kind of function that models it and its rate or factor.

Write the letter of the matching answer on each line.

1. _____ A savings jar gets $15 more each week.
2. _____ A town's population grows by 3% each year.
3. _____ A car's value drops by 12% each year.
4. _____ A candle burns down 0.5 inch each hour.

A. Exponential: multiplied by 0.88 each year

B. Exponential: multiplied by 0.12 each year

C. Linear: adds 15 each week

D. Exponential: multiplied by 1.03 each year

E. Linear: adds 3 each year

F. Linear: subtracts 0.5 each hour

x goes up by 3 in each row

x	y
0	2
3	11
6	20
9	29

5. In this table, x goes up by 3 in each row. For any two rows, what is the change in y for each increase of 1 in x?

_____

6. Let $f(x) = mx + b$ be a linear function. Which expression is equal to $f(x + h) - f(x)$ for all values of m, b, h and x?

A. $mh + b$ B. $m + h$ C. mh D. $mx + h$

x goes up by 1 in each row; one output is missing

x	y
0	3

x	y
1	?
2	48
3	192

7. In this table, x goes up by 1 in each row, and each output is the output before it multiplied by the same factor. What is the missing output, at $x = 1$?

_____

An account's balance at the end of each year; the years go up by 1 in each row

Year	Balance
0	$1,000
1	$1,100
2	$1,210
3	$1,331

8. The table shows an account's balance at the end of each year, and the years go up by 1 in each row. Which statements are true for the rows shown? Select the two true statements.

☐ A. The rows fit a linear function.
☐ B. The balance grows by 10% each year.
☐ C. The balance doubles every year.
☐ D. The balance grows by $100 each year.
☐ E. Each balance is 1.1 times the balance the year before.