Change Detective

Sort the changes, then write a model

A1P.AF.H.24.c "Define exponential functions to represent situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another."

NAME _____ DATE _____

CONSTANT PERCENT

The quantity changes by the same percent of its current value each interval. An exponential function models this change.

A cactus is 12 cm tall and grows 10% each week. If w is the number of weeks, $C(w) = 12(1.10)^w$.

CONSTANT AMOUNT

The quantity changes by the same number of units each interval, not by a percent of its current value. A linear function models this change.

A bus has 18 riders and gains 4 riders at each stop. If s is the number of stops, $R(s) = 18 + 4s$.

1 SORT

8 items

Circle PERCENT or AMOUNT for each situation, then choose one item from each category and explain how you knew in Part 2.

1.	A phone is worth $800 now; each year its value is 80% of the previous year's value.	PERCENT	AMOUNT
2.	A video has 250 views on day 0 and gains 40 views each day.	PERCENT	AMOUNT
3.	A rental fee starts at $35 and rises $6 per day.	PERCENT	AMOUNT
4.	A medicine dose starts at 120 mg; 25% of what remains is removed each hour.	PERCENT	AMOUNT
5.	A mold patch covers 5 cm^2 and doubles in area every 12 hours.	PERCENT	AMOUNT
6.	A snowbank is 50 cm tall and loses 2 cm per sunny day.	PERCENT	AMOUNT
7.	A savings account has $400 and earns 3% of its current balance each month.	PERCENT	AMOUNT
8.	A stack starts with 80 flyers; 10 flyers are removed each morning until it is empty.	PERCENT	AMOUNT

2 PROVE IT

Explain your thinking

Choose one item from each category and explain how you knew in Part 2.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new situation for each category, then write a function for each situation and define its input variable.

PERCENT

AMOUNT

CHALLENGE

Choose a PERCENT item from Part 1 that describes decay, write its exponential function, and find its value after two intervals.

ANSWER KEY # Change Detective

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	A phone is worth $800 now; each year its value is 80% of the previous year's value.	**PERCENT**	Each year, the value is multiplied by 0.80.
2	A video has 250 views on day 0 and gains 40 views each day.	**AMOUNT**	The video gains a fixed 40 views per day.
3	A rental fee starts at $35 and rises $6 per day.	**AMOUNT**	The fee increases by a fixed $6 per day.
4	A medicine dose starts at 120 mg; 25% of what remains is removed each hour.	**PERCENT**	Each hour, 25% of the current amount is removed.
5	A mold patch covers 5 cm² and doubles in area every 12 hours.	**PERCENT**	Doubling each interval is a 100% increase.
6	A snowbank is 50 cm tall and loses 2 cm per sunny day.	**AMOUNT**	Its height decreases by a fixed 2 cm per sunny day.
7	A savings account has $400 and earns 3% of its current balance each month.	**PERCENT**	The increase each month is 3% of the current balance.
8	A stack starts with 80 flyers; 10 flyers are removed each morning until it is empty.	**AMOUNT**	A fixed 10 flyers are removed each morning.

PART 2 · PROVE IT

Task: Choose one item from each category and explain how you knew in Part 2.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **PERCENT**: A painting is worth $500 and gains 6% in value each year. If t is the number of years, $V(t) = 500(1.06)^t$.
- **AMOUNT**: A theater has sold 20 tickets and sells 7 more each hour. If h is the number of hours, $T(h) = 20 + 7h$.

Challenge: Item 1: If t is the number of years, $V(t) = 800(0.80)^t$. After two years, $V(2) = \$512$.

For Part 2, students should explain the change in each interval. For example, item 1 uses 80% of the previous value, while item 2 adds 40 views each day.