Rate Detective

Does the amount change by the same number each time?

8A.AF.I.26.b "Define linear functions to represent situations in which one quantity changes at a constant rate per unit interval relative to another."

NAME _____ DATE _____

CONSTANT RATE

For every equal step in the input, the output changes by the same amount. A linear function can model the situation.

A spool holds 27 meters of thread. Each craft uses 4 meters, so the thread left after c crafts is T = 27 - 4c.

CHANGING RATE

For equal steps in the input, the output changes by different amounts. One linear function cannot model the whole situation.

A mosaic has 1 tile at stage 1, 4 tiles at stage 2, and 9 tiles at stage 3. The increases are 3 tiles and 5 tiles.

1 SORT

8 items

Circle CONSTANT or CHANGING for each item, then choose one item from each group and explain how you know.

1.	A plant is 6 cm tall and grows 2 cm each week.	CONSTANT	CHANGING
2.	A tank holds 40 L of water and loses 3 L each minute.	CONSTANT	CHANGING
3.	A video gains 1 view in hour 1, 2 views in hour 2, and 4 views in hour 3.	CONSTANT	CHANGING
4.	A booth has sold 12 tickets and sells 5 more each hour.	CONSTANT	CHANGING
5.	A runner travels 2 km in the first hour, 3 km in the second, and 5 km in the third.	CONSTANT	CHANGING
6.	A savings balance is $2 after week 1, $6 after week 2, and $18 after week 3.	CONSTANT	CHANGING
7.	A worker earns a $15 bonus plus $9 for each hour worked.	CONSTANT	CHANGING
8.	A candle is 18 cm tall and burns down 2 cm each hour.	CONSTANT	CHANGING

2 PROVE IT

Explain your thinking

Choose one item from each group and explain how you know.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new situation with a constant rate and one with a changing rate. Include numbers that show the change over equal time intervals.

CONSTANT

CHANGING

CHALLENGE

Choose one CONSTANT item. Define the input and output, write a linear function for the situation, and find the output after 4 input units.

ANSWER KEY # Rate Detective

GRADE 8 · 8A.AF.I.26.b

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	A plant is 6 cm tall and grows 2 cm each week.	**CONSTANT**	Its height increases by 2 cm per week.
2	A tank holds 40 L of water and loses 3 L each minute.	**CONSTANT**	The amount of water decreases by 3 L per minute.
3	A video gains 1 view in hour 1, 2 views in hour 2, and 4 views in hour 3.	**CHANGING**	The views gained per hour are not equal.
4	A booth has sold 12 tickets and sells 5 more each hour.	**CONSTANT**	The number of tickets sold increases by 5 per hour.
5	A runner travels 2 km in the first hour, 3 km in the second, and 5 km in the third.	**CHANGING**	The distance traveled per hour changes.
6	A savings balance is $2 after week 1, $6 after week 2, and $18 after week 3.	**CHANGING**	The balance increases by $4, then by $12, over equal one-week intervals.
7	A worker earns a $15 bonus plus $9 for each hour worked.	**CONSTANT**	The earnings increase by $9 per hour.
8	A candle is 18 cm tall and burns down 2 cm each hour.	**CONSTANT**	Its height decreases by 2 cm per hour.

PART 2 · PROVE IT

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

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **CONSTANT**: A bakery has 30 muffins and sells 4 muffins each hour.
- **CHANGING**: A robot travels 2 meters in minute 1, 5 meters in minute 2, and 9 meters in minute 3.

Challenge: For item 7, h is hours worked and E is total earnings in dollars. E = 15 + 9h, so E = 51 after 4 hours.

Items 1, 2, 4, 7, and 8 have constant rates. For Part 2, explanations should compare changes over equal intervals, such as 3 L lost each minute in item 2 versus different numbers of views gained each hour in item 3.