

Change Pattern Detectives

Sort situations by how their values change.

CCSS.Math.Content.HSF-LE.A.1 "Distinguish between situations that can be modeled with linear functions and with exponential functions."

NAME _____

DATE _____

LINEAR CHANGE

In equal input intervals, the output changes by the same added or subtracted amount. A starting value may be included.

A recipe uses 3 cups of rice for one batch, plus 2 more cups for every additional batch.

EXPONENTIAL CHANGE

In equal input intervals, the output is multiplied by the same factor. The factor can show growth or decay.

A photo file begins at 64 megabytes and becomes one-half its size after every compression.

1 SORT _____ 8 items

For each situation, circle LINEAR or FACTOR, then choose two situations and explain whether equal intervals use the same added amount or the same multiplier.

- | | | | |
|----|--|------------------------------|------------------------------|
| 1. | A club collects 40 cans in its first week and 40 more cans each week after that. | ☐ LINEAR | ☐ FACTOR |
| 2. | A jar has 6 coins, and 6 coins are added every Monday. | ☐ LINEAR | ☐ FACTOR |
| 3. | A rumor reaches twice as many people each hour. | ☐ LINEAR | ☐ FACTOR |
| 4. | A tank drains 9 gallons each minute. | ☐ LINEAR | ☐ FACTOR |
| 5. | A phone's value is 80% of its previous value each year. | ☐ LINEAR | ☐ FACTOR |
| 6. | A colony of yeast quadruples every 3 hours. | ☐ LINEAR | ☐ FACTOR |
| 7. | A taxi fare starts at \$4 and rises \$2 per mile. | ☐ LINEAR | ☐ FACTOR |
| 8. | A medicine dose leaves 70% of its amount in the body every 6 hours. | ☐ LINEAR | ☐ FACTOR |

2 PROVE IT Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ HOW I KNEW _____

ITEM # _____ HOW I KNEW _____

3 MAKE YOUR OWN One of each

Write one new situation with LINEAR change and one new situation with FACTOR change.

LINEAR _____

FACTOR _____

CHALLENGE

Write an equation for a quantity that starts at 18 when $x = 0$ and adds 5 for each 1-unit increase in x , then write an equation for a quantity that starts at 18 when $x = 0$ and is multiplied by 5 for each 1-unit increase in x .

PART 1 • SORT

#	ITEM	CATEGORY	WHY
1	A club collects 40 cans in its first week and 40 more cans each week after that.	LINEAR	The total increases by 40 cans each week.
2	A jar has 6 coins, and 6 coins are added every Monday.	LINEAR	The number of coins increases by 6 each week.
3	A rumor reaches twice as many people each hour.	FACTOR	The number of people is multiplied by 2 each hour.
4	A tank drains 9 gallons each minute.	LINEAR	The amount of water decreases by 9 gallons each minute.
5	A phone's value is 80% of its previous value each year.	FACTOR	The value is multiplied by 0.80 each year.
6	A colony of yeast quadruples every 3 hours.	FACTOR	The colony size is multiplied by 4 every 3 hours.
7	A taxi fare starts at \$4 and rises \$2 per mile.	LINEAR	The fare increases by \$2 for each mile after the initial fee.
8	A medicine dose leaves 70% of its amount in the body every 6 hours.	FACTOR	The amount is multiplied by 0.70 every 6 hours.

PART 2 • PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 • MAKE YOUR OWN (SAMPLE ANSWERS)

- **LINEAR:** A streaming service charges \$11 per month plus \$2 for each movie rental.
- **FACTOR:** A \$200 investment is worth 1.04 times as much after each year.

Challenge: Linear: $y = 18 + 5x$. Exponential: $y = 18(5)^x$.

Accept equivalent descriptions that identify a constant additive change for LINEAR or a constant multiplicative factor for FACTOR. In Part 2, students should name the repeated amount or factor for each selected situation.