## Essential Question: How do we determine if a situation or set of data is best modeled by a linear or exponential function?

Do Now: Consider the functions shown below.

| $x$ | $h(x)$ |
| :---: | :---: |
| 0 | 1 |
| 1 | 3 |
| 2 | 9 |
| 3 | 27 |
| 4 | 81 |
| 5 | 243 |


| $x$ | $f(x)$ |
| :---: | :---: |
| 0 | 6 |
| 1 | 12 |
| 2 | 18 |
| 3 | 24 |
| 4 | 30 |
| 5 | 36 |

a. Determine whether the function is linear or exponential.
b. Write an equation that models the function.
$h(x)=$ $\qquad$ $f(x)=$ $\qquad$

## Is it Linear or Exponential?

Determine if the situation below should be modeled with a linear function or an exponential function. Be ready to justify your response.

| Situation | Linear or Exponential |
| :--- | :--- |
| 1. A bank balance that grows at a rate of $3.5 \%$ per year, compounded <br> annually. |  |
| 2. <br> The cost of a cell phone service that charges a monthly fee in addition to 2 <br> cents per text. |  |
| 3. A checking account balance in which $\$ 150$ is deducted every month. |  |
| 4.The concentration of medicine in a person's body that decays by a factor of <br> one-fourth every hour. |  |

How do we recognize which function best models a situation?

- If a situation requires repeated addition or subtraction of a constant value, then it is best represented by a $\qquad$ function.
- If a situation represents a growth or decay by multiplying by a common factor, then it is best represented by an $\qquad$ function.


## Partner Activity

In their entrepreneurship class, students are given two ways to earn a commission selling cookies. For both options, students will be paid according to the number of boxes they are able to sell, with commissions being paid only after all sales have ended. Students must commit to one commission option before they begin selling.

Option 1: The commission for each box of cookies sold is 2 dollars.
Option 2: The commission will be based on the total number of boxes of cookies sold as follows: 2 cents is the total commission if one box is sold, 4 cents is the commission if two boxes are sold, 8 cents if three boxes are sold, and so on, doubling the amount for each additional box sold. (This option is based upon the total number of boxes sold and is paid on the total, not on each individual box.)
a. Write function equations to model each option.

Option 1: $f(x)=$ $\qquad$

Option 2: $\mathbf{g}(\mathbf{x})=$ $\qquad$

Use the tables to the right to help you make sense of the situation.
Think about an appropriate domain for this situation.

b. If Barbara thinks she can sell five boxes of cookies, should she choose Option 1 or 2?
c. Which option should she choose if she thinks she can sell ten boxes? Explain.
d. How many boxes of cookies would a student have to sell before Option 2 pays more than Option 1? Justify your response.

