Linear vs Exponential Worksheet

Algebra 1 · Common Core HSF-LE.A.1

> Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Practice

Builds the skill step by step.

1. Which sequence grows by equal differences?

   A. 2, 6, 18, 54

   B. 3, 7, 11, 15

   C. 1, 4, 9, 16

   D. 5, 10, 20, 40

2. Which sequence grows by equal factors?

   A. 3, 7, 11, 15

   B. 1, 4, 9, 16

   C. 2, 6, 18, 54

   D. 10, 20, 30, 40

3. Which situation is best modeled by a linear function?

   A. a population growing 5% each year

   B. a rumor that doubles every day

   C. a car losing 10% of its value each year

   D. saving 20 dollars each week

4. Which situation is best modeled by an exponential function?

   A. a population growing 5% each year

   B. a candle burning 2 cm each hour

   C. a phone plan adding 10 dollars a month

   D. walking 3 miles per hour

5. The table shows y for x = 0, 1, 2, 3. What is the common difference?

x	0	1	2	3
y	5	8	11	14

6. The table shows y for x = 0, 1, 2. What is the common ratio?

x	0	1	2
y	4	12	36

7. Which situation shows decay by a constant percent?

   A. a tank draining 5 gallons a minute

   B. a car losing 10% of its value each year

   C. a ramp going down 2 feet per foot

   D. a candle burning 1 inch per hour

8. A candle burns 2 cm each hour. What kind of function models its height?

   A. linear

   B. exponential

   C. quadratic

   D. constant

9. What kind of sequence is 10, 5, 2.5, 1.25, ...?

   A. linear (arithmetic)

   B. neither

   C. exponential (geometric)

   D. quadratic

10. A function changes by equal differences over equal intervals. What kind is it?

    A. linear

    B. exponential

    C. quadratic

    D. none

ALBERT

Name _____ Date _____

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On Level

Grade-level practice.

1. The table shows a linear function. By how much does y change for each 1-unit increase in x?

x	0	2	4	6
y	3	7	11	15

2. The table shows an exponential function. What is the common ratio?

x	0	1	2	3
y	100	80	64	51.2

3. Which table is neither linear nor exponential (x = 0, 1, 2, 3)?

   A. y: 1, 3, 5, 7

   B. y: 1, 3, 9, 27

   C. y: 8, 4, 2, 1

   D. y: 1, 2, 4, 7

4. Show that an exponential function $f(x) = a \cdot b^x$ grows by equal factors over equal intervals of length 1.

5. An account earns 50 dollars of interest each year, no matter the balance. What kind of function models the balance?

   A. linear

   B. exponential

   C. quadratic

   D. constant

6. Each person who hears a rumor tells 2 new people the next day. What kind of function models the number of new people told each day?

   A. exponential

   B. linear

   C. constant

   D. quadratic

7. A linear table has y = 2, 6 and 10 at x = 0, 1 and 2. What is y at x = 3?

8. An exponential table has y = 3, 6 and 12 at x = 0, 1 and 2. What is y at x = 5?

9. Prices rise 3% each year. What kind of function models the price?

   A. linear growth

   B. exponential growth

   C. exponential decay

   D. linear decay

10. Show that a linear function f(x) = mx + b grows by equal differences over equal intervals.

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Challenge

Multi-step and word problems that stretch it.

1. Is the sequence 2, 5, 10, 17, ... linear, exponential or neither?

   A. neither

   B. linear

   C. exponential

   D. both

2. The table shows an exponential function. By what factor does y grow every 3 units of x?

x	0	3	6	9
y	8	12	18	27

3. A tree grows 1 foot every year. What kind of function models its height?

   A. linear

   B. exponential

   C. quadratic

   D. constant

4. An exponential function's outputs are multiplied by 9 every time x increases by 2. By what factor are they multiplied when x increases by 1?

5. A town of 500 people adds 50 people each year. What kind of function models its population?

   A. linear

   B. exponential

   C. quadratic

   D. constant

6. An exponential function has values 3, 9, 27 and 81 at x = 1, 2, 3 and 4. What is its value at x = 0?

7. A linear function has f(0) = 4 and increases by 6 for each 1-unit increase in x. What is f(10)?

8. Account A gains 2% each month. Account B gains 20 dollars each month. Classify each as linear or exponential and explain.

9. Which function grows by equal factors?

   A. $f(x) = 7x + 1.2$

   B. $f(x) = 1.2x^2$

   C. $f(x) = 7(1.2)^x$

   D. $f(x) = 7 - 1.2x$

10. $f(x) = 500(0.9)^x$. By what percent does f decrease each time x increases by 1?