

## Writing Exponential Functions

For questions 1-4 use finite differences to determine if each table represents an exponential function.

1.

$x$	$y$
0	2
1	6
2	18
3	54

*SOLUTION:*

$$\Delta x = 1; \frac{y_n}{y_{n-1}} = \frac{6}{2} = \frac{18}{6} = \frac{54}{18} = 3$$

Values are constant; exponential

*ANSWER:*

yes

2.

$x$	$y$
0	3
1	4
2	7
3	12

*SOLUTION:*

$$\Delta x = 1; \frac{y_n}{y_{n-1}} \neq \frac{4}{3} \neq \frac{7}{4} \neq \frac{12}{7}$$

Values are not constant; not exponential

*ANSWER:*

no

3.

$x$	$y$
0	0
1	1
2	8
3	27

*SOLUTION:*

$$\Delta x = 1; \frac{y_n}{y_{n-1}} \neq \frac{1}{0} \neq \frac{8}{1} \neq \frac{27}{8}$$

Values are not constant; not exponential

*ANSWER:*

No

4.

$x$	$y$
0	3
1	6
2	12
3	24

*SOLUTION:*

$$\Delta x = 1; \frac{y_n}{y_{n-1}} = \frac{6}{3} = \frac{12}{6} = \frac{24}{12} = 2$$

Values are constant; exponential

*ANSWER:*

yes

For questions 5-8 identify if each table represents an exponential function or not. If the table represents an exponential function, identify the common ratio.

5.

$x$	$y$
1	2
2	4
3	6
4	8

*SOLUTION:*

$$\Delta x = 1; \frac{y_n}{y_{n-1}} \neq \frac{4}{2} \neq \frac{6}{4} \neq \frac{8}{6}$$

Not exponential

*ANSWER:*

No; none

6.

$x$	$y$
1	2
2	4
3	8
4	16

SOLUTION:

$$\Delta x = 1; \frac{y_n}{y_{n-1}} = \frac{4}{2} = \frac{8}{4} = \frac{16}{8} = 2$$

Constant; exponential

ANSWER:

Exponential Function: Yes

Common Ratio: 2

SOLUTION:

$$\Delta x = 1; \frac{y_n}{y_{n-1}} = \frac{1}{4} = \frac{0.25}{1} = \frac{0.0625}{0.25} = 0.25$$

Constant; exponential

ANSWER:

Exponential Function: Yes

Common Ratio: 0.25

For questions 9-12 use the situation below.

**A sheet of paper is 0.1 mm thick. When the paper is folded in half, the total thickness of the layers of paper is 0.2 mm. When the paper is folded in half again, the total thickness of the layers of paper is 0.4 mm.**

7.

$x$	$y$
1	3
2	4.5
3	6.75
4	10.125

SOLUTION:

$$\Delta x = 1; \frac{y_n}{y_{n-1}} = \frac{4.5}{3} = \frac{6.75}{4.5} = \frac{10.125}{6.75} = 1.5$$

Constant; exponential

ANSWER:

Exponential Function: Yes

Common Ratio: 1.5

9. Complete the table below to represent the situation.

SOLUTION:

$$0.1 * 2 = 0.2$$

$$0.2 * 2 = 0.4$$

$$0.4 * 2 = 0.8$$

$$0.8 * 2 = 1.6$$

ANSWER:

NUMBER OF FOLDS $x$	TOTAL THICKNESS OF LAYERS $y$
0	0.1
1	0.2
2	0.4
3	0.8
4	1.6

8.

$x$	$y$
1	4
2	1
3	0.25
4	0.0625

10. Does the situation represent a linear function or an exponential function? Justify your answer.

ANSWER:

Exponential;  $\Delta x$  is constant,  $\Delta y$  is not constant, and  $\frac{y_n}{y_{n-1}}$  is constant

11. Which of the following represents the function that models this situation?

- A.  $y = x + 0.1$
- B.  $y = 2 * 0.1^x$
- C.  $y = 0.1 * 2^x$
- D.  $y = 2^x + 0.1$

ANSWER:

C.  $y = 0.1 * 2^x$

SOLUTION:

$$\Delta x = 1; \frac{yn}{yn-1} = \frac{8}{40} = \frac{1.6}{8} = \frac{0.32}{1.6} = 0.2$$

Constant; Exponential

ANSWER:

Exponential Function: Yes

Function:  $y = 40 * 0.2^x$

12. Which of the following statements are true about the situation?

ANSWER:

Which of the following statements are true about the situation?

- $\Delta x = 1$
- The situation is an example of exponential decay.
- The function is increasing.
- The common ratio is 2.
- The y-intercept is (0, 0.1).
- The function is linear.
- The function is decreasing.
- $\Delta y = 0.1$
- The common ratio is 0.2.
- The situation is an example of exponential growth.

For questions 13-18 identify if each table represents an exponential function or not. If the table represents an exponential function, write the function relating the variables.

13.

x	y
0	0
1	4
2	32
3	108

SOLUTION:

$$\Delta x = 1; \frac{yn}{yn-1} \neq \frac{4}{0} \neq \frac{32}{4} \neq \frac{108}{32}$$

Not constant; not exponential

ANSWER:

Exponential Function: No

Function: none

14.

x	y
0	40
1	8
2	1.6
3	0.32

15.

x	y
0	50
1	25
2	12.5
3	6.25

SOLUTION:

$$\Delta x = 1; \frac{yn}{yn-1} = \frac{25}{50} = \frac{12.5}{25} = \frac{6.25}{12.5} = 0.5$$

Constant; Exponential

ANSWER:

Exponential Function: Yes

Function:  $y = 50 * 0.5^x$

16.

x	y
1	300
2	150
3	100
4	75

SOLUTION:

$$\Delta x = 1; \frac{yn}{yn-1} \neq \frac{150}{300} \neq \frac{100}{150} \neq \frac{75}{100}$$

Not constant; not exponential

ANSWER:

Exponential Function: No

Function: none

17.

$x$	$y$
1	4500
2	6750
3	10,125
4	15,187.5

*SOLUTION:*

$$\Delta x = 1; \frac{yn}{yn-1} = \frac{6750}{4500} = \frac{10125}{6750} = \frac{15187.5}{10125} = 1.5$$

Constant; Exponential

$$x = 0, \frac{4500}{a} = 1.5; \frac{4500}{1.5} = 3000 = a$$

*ANSWER:*

Exponential Function: Yes

$$\text{Function: } y = 3000 * 1.5^x$$

18.

$x$	$y$
1	14
2	56
3	224
4	896

*SOLUTION:*

$$\Delta x = 1; \frac{yn}{yn-1} = \frac{56}{14} = \frac{224}{56} = \frac{896}{224} = 4$$

Constant; Exponential

$$x = 0, \frac{14}{a} = 4; \frac{14}{4} = 3.5 = a$$

*ANSWER:*

Exponential Function: Yes

$$\text{Function: } y = 3.5 * 4^x$$

**For questions 19-20 use the situation below.**

A sheet of paper has an area of 100 square inches. When the paper is cut in half, the area of one piece is 50 square inches. When that piece is cut in half, the area of one piece is 25 square inches.

NUMBER OF CUTS $x$	AREA OF ONE PIECE $y$
0	100
1	50
2	25

19. What would be the area of one piece after 5 cuts?

*SOLUTION:*

$$\frac{yn}{yn-1} = \frac{50}{100} = \frac{25}{50} = .5;$$

$$25 * .5 = 12.5$$

$$12.5 * .5 = 6.25$$

$$6.25 * .5 = 3.125$$

*ANSWER:*

3.125 square inches

20. Write the function relating the variables.

*ANSWER:*

$$y = 100 * 0.5^x$$