LESSON MAKER PRO

Ratio Detectives

Find the factor that connects exponential values.

HIGH SCHOOL · MT.CORE.ALG.EXP.1

MT.CORE.ALG.EXP.1 "Understand that exponential functions have a constant common ratio over equal intervals, and identify the common ratio in tables and equations."

NAME _____ DATE _____

THE COMMON RATIO

When x-values increase by equal amounts, divide each output by the one before it. An exponential function has the same ratio for every equal step. In $y = a(b)^x$, b is the ratio for a 1-unit step, and b^d is the ratio for a step of d units.

WORKED EXAMPLE

Find the common ratio for each 1-unit increase in x if $f(x) = 18(5/6)^x$.

1. At x = 0, f(0) = 18.
2. At x = 1, f(1) = 18(5/6) = 15.
3. Divide: 15/18 = 5/6.

Answer: The common ratio is 5/6.

PRACTICE 6 problems

1 Find the common ratio between consecutive rows.

FUNCTION VALUES

x	y
0	4
1	12
2	36
3	108

ANSWER _____

2 Find the common ratio between consecutive rows.

FUNCTION VALUES

x	y
0	96
1	48
2	24
3	12

ANSWER _____

3 Find the common ratio for each 1-unit increase in x: $g(x) = 11(4/3)^x$.

ANSWER _____

4 Find the common ratio for each 1-unit increase in x: $h(x) = 72(3/4)^x$.

ANSWER _____

5 The x-values increase by the same amount in each row. Find the common ratio between consecutive rows.

FUNCTION VALUES

x	y
0	2
2	8
4	32
6	128

ANSWER _____

6 For $k(x) = 40(1/4)^x$, find the common ratio when x increases by 2.

ANSWER _____

APPLY IT Show your work

1 A new video clip has the view totals shown. If the pattern continues, find the common ratio per hour and the total views at hour 3.

VIDEO VIEWS

Hour	Total views
0	120
1	180
2	270

ANSWER _____

2 A gaming headset's resale value is modeled by $V(x) = 640(3/4)^x$, where x is years after purchase and V(x) is in dollars. Find the common ratio per year and the value after 2 years.

WORK SPACE

ANSWER _____

CHALLENGE One step up

The table follows an exponential pattern. Find the common ratio for each 2-day step and for each 1-day step. Explain how the two ratios relate.

DAILY GROWTH

Day	Count
0	20
2	180
4	1620

WORK SPACE AND ANSWER

ANSWER KEY

Ratio Detectives

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the common ratio between consecutive rows.	**3**
2	Find the common ratio between consecutive rows.	**1/2**
3	Find the common ratio for each 1-unit increase in x: $g(x) = 11(4/3)^x$.	**4/3**
4	Find the common ratio for each 1-unit increase in x: $h(x) = 72(3/4)^x$.	**3/4**
5	The x-values increase by the same amount in each row. Find the common ratio between consecutive rows.	**4**
6	For $k(x) = 40(1/4)^x$, find the common ratio when x increases by 2.	**1/16**

PART 2 · APPLY IT

1. **Common ratio: 3/2; views at hour 3: 405** Divide 180 by 120 and 270 by 180 to get 3/2 each time. Multiply 270 by 3/2 to get 405.
2. **Common ratio: 3/4; value after 2 years: $360** The base 3/4 is the yearly ratio. $V(2) = 640(3/4)^2 = 360$.

CHALLENGE

The ratio for each 2-day step is 9, and the ratio for each 1-day step is 3. Two 1-day steps multiply by 3 × 3 = 9.

Accept equivalent exact fractions or terminating decimals. For the challenge, accept any explanation showing that the 1-day ratio multiplied by itself equals 9.