Rate of Change and Writing Functions

Date:

Standards

- F.IF.6 - Calculate and interpret the average rate of change of a function
- F.IF.4 - For a function, interpret key features of the tables
- F.BF.1 Write a function that describes a relationship between two quantities.

Essential Questions

- What is Rate of change?
- How can I determine the rate of change of a t-table?
- How can I write a function that describes a relationship?

What is Rate of Change?

Rate of Change: the relationship between two quantities that are changing

$$\text{Rate of Change} = \frac{\text{Change in the dependent variable}}{\text{Change in the independent variable}}$$

$$= \frac{\text{Change in output}}{\text{Change in input}} = \frac{\text{Change in range}}{\text{Change in domain}}$$

Common examples:

speed (mi/hr, km/hr etc.)

price (dollars/pound, dollars/gallon etc.).

How can I determine the rate of change of a t-table?

1) Find the change in domain
2) Find the change in range
3) Find the rate of Change
4) Simplify if necessary

Number of hours	Distance traveled
1	15
2	30
3	45
4	60

+ 1
+ 1
+ 1

+ 15
+ 15
+ 15

Domain

1, 2, 3, 4

Range

15, 30, 45, 60

Change in Domain

1 hour

Change in Range

15 miles

Rate of Change

$$\frac{15\ miles}{1\ hour} = \text{15 miles per hour}$$

How can I determine the rate of change of a t-table?

Number of items bought	Total amount paid
1	$12.52
2	$25.04
3	$37.56
4	$50.08

+ 1
+ 1
+ 1

+ $12.52
+ $12.52
+ $12.52

Domain

1, 2, 3, 4

Range

$12.52, $25.04, $37.56, $50.08

Change in Domain

1 item

Change in Range

$12.52

Rate of Change

$$\frac{\$12.52}{1\ item} = \$12.52 \text{ per item}$$

How can I determine the rate of change of a t-table?

Hour worked	Total earnings
3	$26
5	$52
7	$78
9	$104

+ 2 + 2 + 2 + 26 + 26 + 26

Domain

3, 5, 7, 9

Range

$39, $65, $78, $104

Change in Domain

2 hours

Change in Range

$26

Rate of Change

$$\frac{\$26}{2\ hour} = \frac{\$13}{1\ hour} =$$ $13 per hour

How can I write a function that describes a relationship?

1) Plug in what you know
2) Solve for b (the initial value)
3) Write your function $f(x) = mx + b$

$$f(x) = mx + b$$

output input Rate of change Initial value

Number of hours	Distance traveled
1	15

$15\ miles\ per\ hour$

$f(x) = mx + b$

$15 = 15(1) + b$

$15 = 15 + b$

$-15 \quad -15$

$0 = b$

$f(x) = 15x + 0$

$f(x) = 15x$

How can I write a function that describes a relationship?

$$f(x) = mx + b$$

output — input — Rate of change — Initial value

Number of items	Amount Paid
1	12.52

$\$12.52\ per\ item$

$$f(x) = mx + b$$

$$12.52 = 12.52(1) + b$$

$$12.52 = 12.52 + b$$

$$-12.52 \quad -12.52$$

$$0 = b$$

$$f(x) = 12.52x + 0$$

$$f(x) = 12.52x$$

How can I write a function that describes a relationship?

$$f(x) = mx + b$$

output input Rate of change Initial value

Hour worked	Total earnings
3	$39

$\$13 \ per \ hour$

$f(x) = mx + b$

$39 = 13(3) + b$

$39 = 39 + b$

$-39 \quad -39$

$0 = b$

$f(x) = 13x + 0$

$f(x) = 13x$

How can I write a function that describes a relationship?

Bryan has a prepaid cell phone with a balance of $75. He changed the same rate per minute.

- After 1 minute, his balance is $74
- After 2 minute, his balance is $73
- After 3 minute, his balance is $72

Domain

1, 2, 3

Range

$74, $73, $72

Change in Domain

1 minute

Change in Range

-$1

Rate of Change

$$\frac{-\$1}{1\ minute} = \text{-\$1 per minute}$$

How can I write a function that describes a relationship?

$$f(x) = mx + b$$

output input Rate of change Initial value

Miles	Balance
1	$74

$-\$1\ per\ minute$

$f(x) = mx + b$

$74 = -1(1) + b$

$74 = -1 + b$

$+1 \quad +1$

$75 = b$

$f(x) = -1x + 75$

$f(x) = -x + 75$

REFLECTION:

1) Answer one essential question.
2) How have previous lessons helped or connect with this lesson?
3) What are you still confused on or what new info did you learn?

Homework

1. What is the domain?
2. What is the range?
3. What is the rate of change?
4. Create a function for the relation

x	*f(x)*
-3	8
0	5
3	2

5. What is the domain?
6. What is the range?
7. What is the rate of change?
8. Create a function for the relation

x	*f(x)*
1	-1
2	5
3	11