**Words to Know**

*Fill in this table as you work through the lesson. You may also use the glossary to help you.*

## **Warm-Up** Comparing Functions in the Real World



**?**

**W2K**

**Explore** changing the

and *y*-intercept.

**Compare** rates of change and

value.

**Examine** real-world scenarios.

**Lesson Goals**

**Lesson Question**

|  |  |
| --- | --- |
|  | in a function, the ratio of the change in the dependent value with respect to the change in the independent value |
|  | the *y*-coordinate of the point where the graph of a line crosses the *y*-axis |
|  | to explain or show the similarities or differences between items or ideas |
|  | the ratio of the change in the dependent values (outputs) to the change in the independent values (inputs) between two points on a line |

**Slide**

### Find and Compare Initial Values of Linear Functions

#### Fala’s Total Savings after January 1

.80

**Savings (dollars)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *y* |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| (0, | 0.1 | 0) |  |  |  |  |  | *x* |



.60

.40 

#### Fai’s Total Savings after January 1

**Days after 1/1:**

***x***

5

+.12

.32

**Savings ($):**

***y***

.20

10



10 20 30 40

#### Days after January 1

15

* ***y*-intercept**

20

+.12

+.12

.68

.56

.44

First find the rate of change of the *y*-values: +0.12.

.32 − .12 =

On January 1st, Fala had $ savings.

Fai’s initial value is $ .

**2**



Meaning that had the highest initial value at $0.20, because

$0.20 is more than $0.10.

**Slide**

### Comparing Rates of Change

**Rate of change,** or , is the ratio of the change in to the change in *x*.

Fala:

*y*

*m*  .40  .10

20  0

## .30

*m* 

.80

.60

**Savings (dollars)**

.40

0, .4

0)

(2

*m*  $

.20

(0, .10)

*x*

10 20 30 40

#### Days after January 1

Fai:

#### Days after 1/1:

|  |  |
| --- | --- |
| ***X*** | ***Y*** |
| 10 | .44 |
| 15 | .56 |
| 20 | .68 |

**Savings ($):**

.12

5 

5

+.12

.12

**4**



* + **Compare** to determine who will save $1.00 first.

Fala saves about $0.015 each day. Fai saves about $0.024 each day.

Since Fai is saving at a greater rate, we can conclude that will save $1 first.

**Slide**

**Changing Slope**

Fala:

.80

*y*

*m*= 0.015

*m* =

.60

.40

**Savings (dollars)**

(20, .40)

Fai:

*m*= 0.024

.20

(0, .10)

*x*

10 20 30 40

#### Days after January 1

|  |  |
| --- | --- |
| **Days after 1/1:*x*** | **Savings ($):*y*** |
| 10 | .44 |
| 20 | .68 |
| 30 | .92 |

**6**



What happens when there is a change of slope in one function compared to the other?

* + - What if Fala’s savings increased at a rate of .03 each day instead of .015?

*y* = + 0.10

*x* = 10 *y* =

*x* = 20 *y* =

* + - Who will save $1.00 first?

Now, we can see that changing the can change the outcome.

**Slide**

### Comparing Initial Value and Rate of Change

**REAL-WORLD CONNECTION**

**Tracy’s plane started at 12,000 feet. After 10 minutes, she was at an altitude of 7,500 feet.**

Tracy: (0, 12000) (10, 7500)

Colette:

Tracy and Colette are on separate planes that are each making the descent to an airport.

* Initial values

Tracy *b* = ft

Colette *b* = ft

16,000

**Altitude (feet)**

12,000

8,000

4,000

0

(4

000)

0

4

00

2

, 12

00)

14

(0,

*y*

4 8 12 16

*x*

#### Time (minutes)

* Rate of change Tracy:

*m*  7,500  12,000

10  0

*m*  4,500

10

*m* 

**9**



Colette:

*m*  2000

4

*m* 

So this means that Colette’s plane is descending at a rate of feet per minute, which is a greater rate than Tracy’s rate.

**Slide**

### Comparing Linear Functions

Tracy:

#### Tracy’s plane started at 12,000 feet. After 10 minutes, she was at an altitude of 7,500 feet.

Colette:

Who is closer to the ground after 16 minutes?

* + Tracy:

*y* = −450*x* + 12,000

*y* = −450(16) + 12,000

16,000

**Altitude (feet)**

12,000

8,000

4,000

0

(4

000)

4 8 12 16

*x*

, 12

00)

14

(0,

*y*

#### Time (minutes)

*y* = −7200 + 12,000

*y* = ft

* Colette:

*y* = −500*x* + 14,000

*y* = −500(16) + 14,000

*y* = −8000 + 14,000

*y* = ft

**9**



is closer to the ground after 16 minutes, at an altitude of 4,800 .

**Slide**

### Changing the *y*-Intercept

What happens when the *y*-intercept of one function changes? Tracy:

#### Tracy’s plane started at 12,000 feet. After 10 minutes, she was at an altitude of 7,500 feet.

Colette:

16,000

*y*

**Altitude (feet)**

* + What if Colette started from 12,500 feet instead of 14,000 feet?
  + Who will be closest to the ground

after 16 minutes?

Tracy:

12,000

8,000

4,000

5

4 8 12 16

*x*

00)

10

(4,

00)

125

(0,

#### Time (minutes)

*y* = −450(16) + 12000

*y* = ft

Colette:

*y* = −500(16) + 12500

*y* = −8000 + 12500

*y* = ft

**11**



Colette is now closer to the ground, at an altitude of feet, than Tracy.

So changing the *y*-intercept can affect the of two linear function comparisons.

# Summary

**Lesson Question**

**??**

How can you use linear relationships to compare real-world situations?

**Lesson Question**

**Answer**

## Comparing Functions in the Real World



*Use this space to write any questions or thoughts about this lesson.*