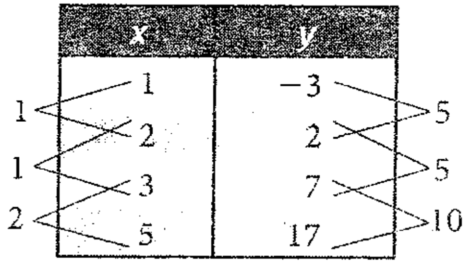
Use a table to determine the slope of a line.

Step 1: Identify the change in each consecutive pair of y-values in the table. In this case, the changes are 5, 5 and 10.

Step 2: : Identify the change in each consecutive pair of x-values in the table. In this case, the changes are 1, 1, and 2.

Step 3: Write ratios showing the corresponding $\frac{\textit{vertical change}}{\textit{horizontal change}}$ *in simplest form.* In this case, the ratios $\frac{5}{1}$, $\frac{5}{1}$, and $\frac{10}{2}$ each simplify to $\frac{5}{1}$.

The slope of the line is $\frac{5}{1}$.



x	y
1	−3
2	2
3	7
5	17

7

Linear Graphing LG3

Finding Slope from Tables

Name________________________________

Date______________________ Period_____

Determine the slope of the line represented by the table of values. Describe the graphs of the line as increasing, decreasing, horizontal, or vertical.

1.

x	y
−2	3
−1	5
0	7
1	9
2	11

m = 2

Graph Description ↑

2.

x	y
−3	5
−2	2
−1	−1
0	−4
1	−7

m = −3

Graph Description ↓

3.

x	y
1	−17
2	−13
3	−9
4	−5
5	−1

m = 4

Graph Description ↑

4.

x	y
−6	−4
−5	−9
−4	−14
−3	−19
−2	−24

m = −5

Graph Description ↓

5.

x	y
0	3
1	5.5
2	8
3	10.5
4	13

+1 +1 +1 +1

+2.5 +2.5 +2.5 +2.5

m = $\frac{\Delta y}{\Delta x}$ 2.5

Graph Description ↑

6.

x	y
−2	5
−1	4.75
0	4.5
1	4.25
2	4

+1 +1 +1

m = $-\frac{1}{4}$

Graph Description ↓

7.

x	y
−2	$\frac{2}{5}$
−1	$\frac{4}{5}$
0	$\frac{6}{5}$
1	$\frac{8}{5}$

$+\frac{2}{5}$ $+\frac{2}{5}$ $+\frac{2}{5}$

$\frac{2}{5}$ $-\frac{2}{5}$ + x = $\boxed{\frac{4}{5} - \frac{2}{5}} = \frac{2}{5}$

m = $\frac{\frac{2}{5}}{1} = \boxed{\frac{2}{5}}$

Graph Description ↑

8.

x	y
−1	1
1	2
3	3
5	4
7	5

m = $\frac{1}{2}$

Graph Description ↑

9.

x	y
−5	10
−2	5
1	0
4	−5
7	−10

m = $\frac{-5}{3}$

Graph Description ↓

10.

x	y
−5	10
−3	6
−1	2
1	−2
3	−6

m = −2

Graph Description ↓

11.

x	y
−4	6
−2	6
0	6
2	6
4	6

m = 0

Graph Description horizontal

12.

x	y
5	2
5	4
5	6
5	8
5	10

m = undefined

Graph Description vertical

8

Algebra 1
Rate of Change

Name: ____________________
Date: ______________ Period: ____

Warm-Up

$f(x) = -2x + 4$	$g(x) = 3^x - 1$	$h(x) = x^2 + 7$

1. h(-3) = 16

$h(x) = x^2 + 7$
$h(-3) = (-3)^2 + 7$

2. g(0) = 0

$g(x) = 3^x - 1$
$g(0) = 3^0 - 1$
$= 1 - 1$

3. f(x) = -10; x = -7

$f(x) = -2x + 4 = -10$
$-4 \quad -4$
$\frac{-2x}{-2} = \frac{-14}{-2}$

4. f(4) – g(1) = $\boxed{-6}$

$-4 - 2 = -6$
$f(4) = -2(4) + 4 = -4$
$g(1) = 3^1 - 1 = 2$

REMINDERS

Rate of Change: describes how one quantity changes as another quantity changes

"Slope"
Average Rate of Change Formula: $\boxed{m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}}$ → "The change in y over the change in x"

Positive ROC: As x increases, y increases

Negative ROC: As x increasing, y decreases

Linear functions have a constant rate of change, meaning values increase or decrease at the SAME rate over a period of time.

Non-Linear functions DO NOT have a constant rate of change, meaning values increase or decrease at different rates over a period of time.

Horizontal Lines have 0 rate of change.

Vertical Lines have undefined rate of change.

SLOPE BETWEEN TWO POINTS

$m = \frac{y_2 - y_1}{x_2 - x_1}$

1. (4, 6) and (-2, -4)
$(x_1, y_1) \quad (x_2, y_2)$
$m = \frac{-4 - 6}{-2 - 4} = \boxed{\frac{5}{3}}$

2. (7, 5) and (7, -8)
$(x_1, y_1) \quad (x_2, y_2)$
$m = \frac{-8 - 5}{7 - 7} = \frac{-13}{0} \leftarrow \boxed{\text{Undefined}}$

3. (-5, 10) and (1, -2)
$(x_1, y_1) \quad (x_2, y_2)$
$m = \frac{-2 - 10}{1 - (-5)} = \boxed{-2}$

TABLES

Find the slope of the line represented by the table. Then describe the function as increasing, decreasing, horizontal, or vertical.

1.

x	y
-2	3
-1	5
0	7
1	9
2	11

+1 +1 +1 +1
+2 +2 +2 +2

m = $\frac{2}{1} = 2$

description:
Positive → increasing

2.

x	y
-5	10
-3	6
-1	2
1	-2
3	-6

+2 +2 +2 +2
-4 -4 -4 -4

m = $\frac{-4}{2} = -2$

description:
decreasing

3.

x	y
-4	6
-2	6
0	6
2	6
4	6

+2 +2 +2 +2
+0 +0 +0 +0

m = $\frac{0}{2} = 0$

description:
horizontal

4.

x	y
5	2
5	4
5	6
5	8
5	10

+0 +0 +0 +0
+2 +2 +2 +2

m = $\frac{2}{0} \leftarrow$ undefined

description:
vertical

Slope

RATE OF CHANGE OVER INTERVAL ← given as x-values!

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

1. f(x) = 3 – 2x over the interval [2, 3].

$f(2)=3-2(2)=-1$ $(\underset{x_1}{2}, \underset{y_1}{-1})$

$f(3)=3-2(3)=-3$ $(\underset{x_2}{3}, \underset{y_2}{-3})$

$$m = \frac{-3-(-1)}{3-2} = \boxed{-2}$$

2. k(x) = 3x + 4 over the interval [-2, 3].

$k(-2)=3(-2)+4=-2$ $(\underset{x_1}{-2}, \underset{y_1}{-2})$

$k(3)=3(3)+4=13$ $(\underset{x_2}{3}, \underset{y_2}{13})$

$$m = \frac{13-(-2)}{3-(-2)} = \frac{15}{5} = \boxed{3}$$

3. k(x) = 3x + 4 over the interval [4, 6].

$k(4)=3(4)+4=16$ $(\underset{x_1}{4}, \underset{y_1}{16})$

$k(6)=3(6)+4=22$ $(\underset{x_2}{6}, \underset{y_2}{22})$

$$m = \frac{22-16}{6-4} = \boxed{3}$$

4. g(x) = 0.5ˣ over the interval [-1, 0].

$g(-1)=.5^{-1}=2$ $(\underset{x}{-1}, \underset{y_1}{2})$

$g(0)=.5^{0}=1$ $(\underset{x_2}{0}, \underset{y_2}{1})$

$$m = \frac{1-2}{0-(-1)} = -1$$

5. g(x) = 0.5ˣ over the interval [-3, 0].

$g(-3)=.5^{-3}=8$ $(\underset{x_1}{-3}, \underset{y_1}{8})$

$g(0)=.5^{0}=1$ $(\underset{x_2}{0}, \underset{y_2}{1})$

$$m = \frac{1-8}{0-(-3)} = \boxed{\frac{-7}{3}}$$

WORD PROBLEMS

1. The table shows the cost per pound of Granny smith apples.

Describe the rates of change show by the data.

+1 +1 +1

x	**Weight (lb)**	1	2	3	4
y	**Cost ($)**	1.49	2.98	4.47	5.96

+1.49 +1.49 +1.49

slope

Describe the rate(s) of change shown by the data.

$$m = \frac{\Delta y}{\Delta x} = \frac{1.49}{1} = 1.49$$

Positive → increasing

· linear

3. The table shows the distance of a courier from her destination.

+15 +15 +15

x	**Time (PM)**	2:15	2:30	2:45	3:00
y	**Distance (miles)**	5.4	5.4	5.0	0.5

+0 -.4 -4.5

What is the rate of change from 2:15 PM to 2:30 PM? What does this rate of change mean?

$$m = \frac{\Delta y}{\Delta x} = \frac{0}{15} = 0$$

She did not move

2. The table shows Gabe's height on his birthday for five years.

+2 +1 +1 +2

x	**Age**	9	11	12	13	15
y	**Height (in)**	58	59.5	61.5	65	69

+1.5 +2 +3.5 +4

Find the rate of change during each time interval.

9 – 11 years: $m = \frac{\Delta y}{\Delta x} = \frac{1.5}{2} = \boxed{\frac{3}{4}}$

11 – 12 years: $m = \frac{\Delta y}{\Delta x} = \frac{2}{1} = \boxed{2}$

12 – 13 years: $m = \frac{\Delta y}{\Delta x} = \frac{3.5}{1} = \boxed{3.5}$

13 – 15 years: $m = \frac{\Delta y}{\Delta x} = \frac{4}{2} = \boxed{2}$

Describe the rates of change shown by the data.

Always positive / increasing

Not Linear

When did the greatest rate of change occur?

12-13yrs

When was the rate of change the least?

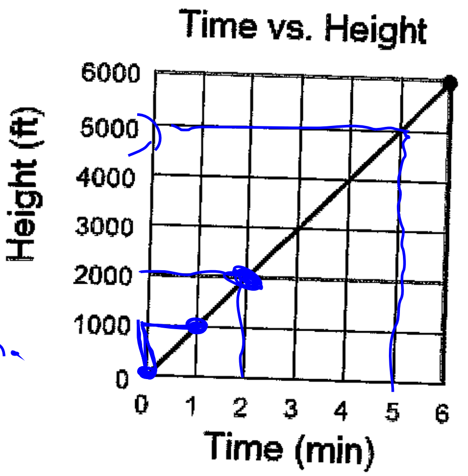
9-11yrs

During which two time periods were the rates of change the same?

11-12 and 13-15

MPM1D **Slope as a rate of Change** **Date:** ______________

1. The following represents the graph for a helium balloon's flight. Determine the $\overset{\text{slope}}{\text{rate of change}}$ of the graph.



$$m = \frac{\Delta y}{\Delta x} = \frac{rise}{run} = \frac{1000}{1} = 1000 \text{ ft per minute}$$

b. What does this slope (rate of change) mean?

After every 1min, balloon goes up 1000 ft.

c. When is the balloon at 5000 ft? Show this on your graph. @ 5 min.

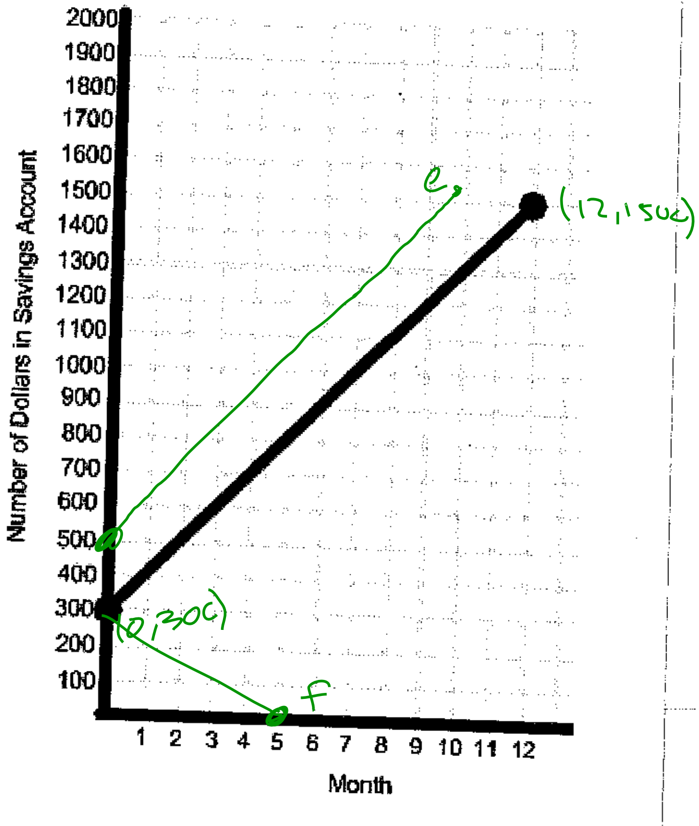
d. How high is the balloon off the ground at 2 ~~seconds~~ minutes? Show this on your graph 2000ft.

e. Although not on the graph, when will the balloon reach 10,000 feet? Show your reasoning

$$= \frac{1000 \text{ ft}}{1 \text{min}} \times \frac{10000 \text{ ft}}{x \text{min}} \rightarrow \frac{\cancel{1000}x}{\cancel{1000}} = \frac{10\cancel{000}}{1\cancel{000}}$$

$$\boxed{x = 10 \text{ min}}$$

2. The following represents the balance in Brady's savings account.



a. Find the slope of the graph.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1500 - 300}{12 - 0} = \frac{1200}{12} = \$100 \text{ per month}$$

b. What does the slope represent as a rate of change?

Every month the account ↑ $100

c. How much did Brady deposit when he opened the account?

$300 ... y-int ... @ month 0

d. At this rate how much money will Brady have in his account after 15 months. Show your reasoning.

eqn: $y = 100x + 300$ ($mx + b$)

when $x = 15$: $y = 100(15) + 300 = \$1800$

e. If Brady deposited $500 to begin with, but continued to deposit the some amount each month what would this graph look like? Sketch it on the graph.

f. If Brady deposited $300 initially, but spent it all in five months show this on the graph?

g. What would the slope of this line be? What does the negative sign indicate?

$\underset{x_1 \ y_1}{(0,300)}$, $\underset{x_2 \ y_2}{(5,0)}$ $\rightarrow \frac{0-300}{5-0} = \frac{-300}{5} = -60$

→ spending $, not saving it

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