ST. JEAN DE BREBEUF MATHEMATICS

CHAPTER 3.1

SLOPE AS A RATE OF CHANGE

CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

KEY CONCEPTS

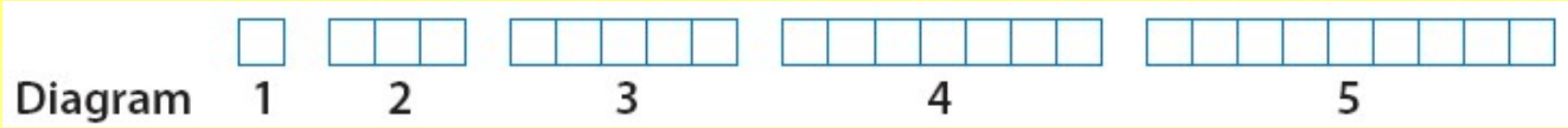
When the change in one variable relative to another variable is constant, the result is a **linear relation.**

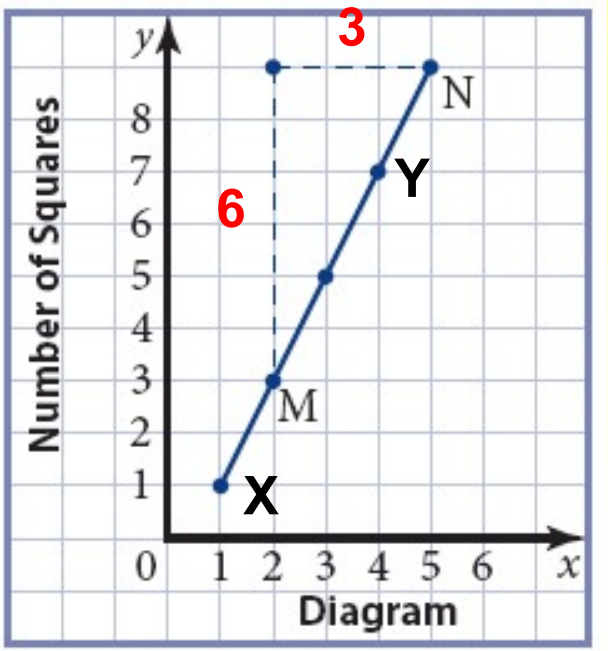
In a linear relation, the **rate of change** and the **slope** are the same.

CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 1 *Calculate the Slope of a Given Line*

The graph shows the number of squares used in each part of this pattern. The points are joined to show the trend.





	RISE	RUN	SLOPE (rise / run)
M to N	6	3	$\frac{6}{3} = 2$
X to Y			

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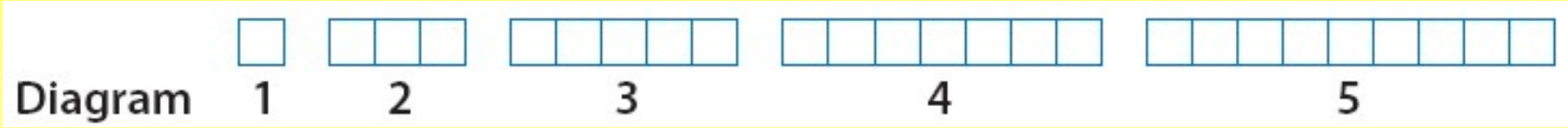

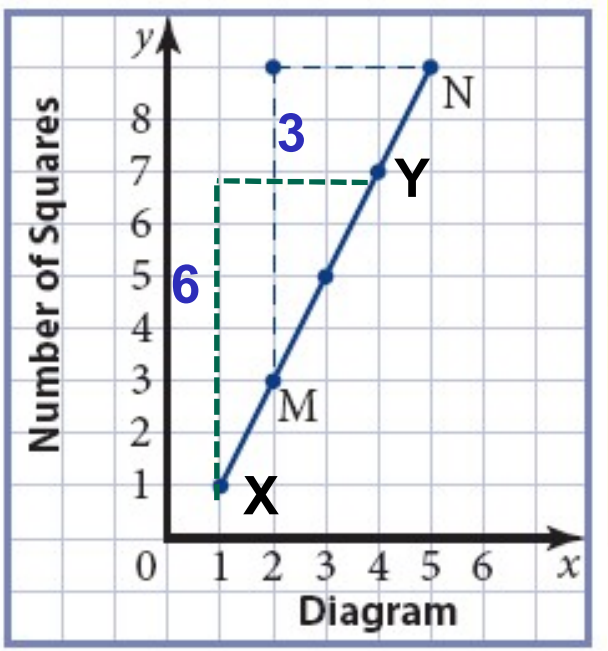

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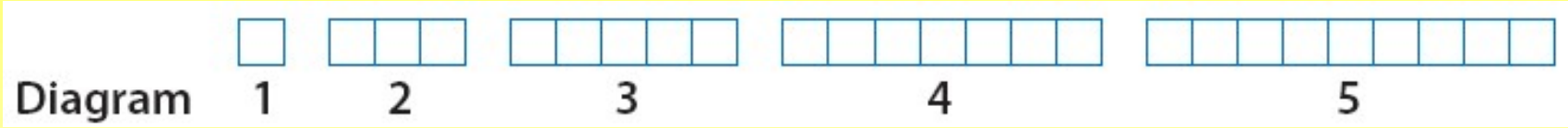

What do you notice about slopes of these segments?

The slopes are the same

What information about the pattern does the slope give?

The number of blocks increases by at least 2 blocks

	RISE	RUN	SLOPE (rise / run)
M to N	6	3	$\frac{6}{3} = 2$
X to Y	6	3	$\frac{6}{3} = 2$

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CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 2 *Calculate Rates of Change*

For the linear relation **y = 2x + 5**, complete the table below and determine the rate of change in the *y*-values

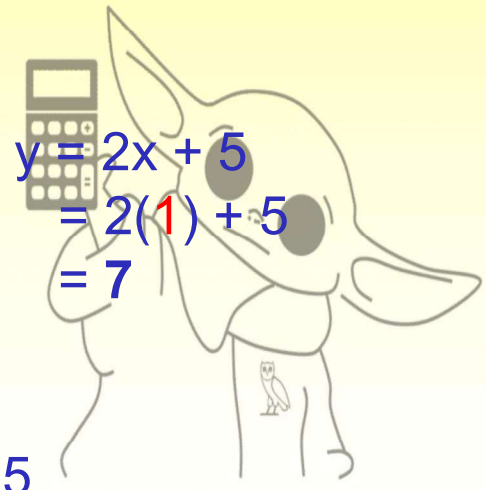
x	y	Rate of Change
0	5	
1	7	
2	9	
3	11	
4	13	

Substitute the *x* values into the linear relation and solve for *y*

y = 2x + 5
= 2(0) + 5
= **5**

y = 2x + 5
= 2(1) + 5
= **7**

y = 2x + 5
= 2(2) + 5
= **9**



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CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 2 *Calculate Rates of Change*

For the linear relation **y = 2x + 5**, complete the table below and determine the rate of change in the *y*-values

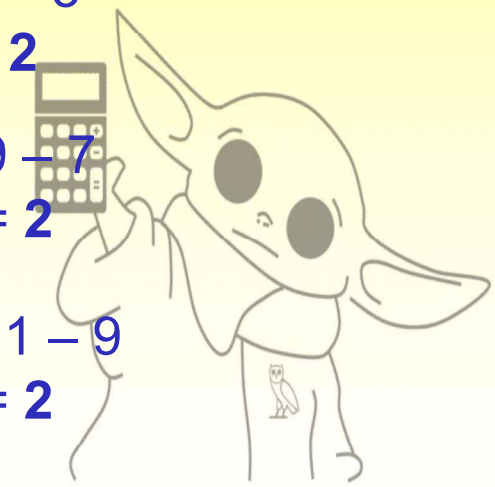
x	y	Rate of Change
0	5	
		2
1	7	
		2
2	9	
		2
3	11	
		2
4	13	

To calculate **rate of change**, you have to subtract the successive *y*-values

7 – 5
= **2**

9 – 7
= **2**

11 – 9
= **2**



Therefore the rate of change of the *y*-values is **2**

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CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 3 *Calculate the Slope for a Given Equation*

For the line **y = – 3x + 2**,

(a) Complete the table below and graph the line

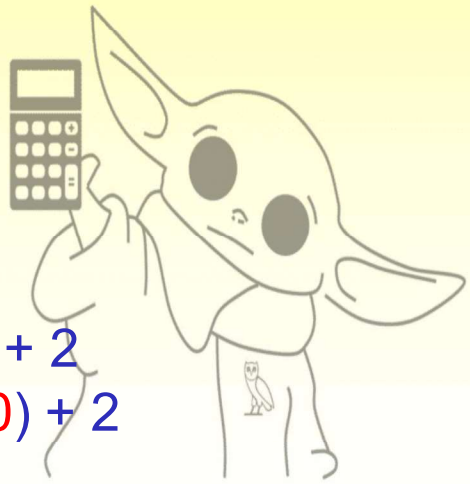
x	y
– 2	8
– 1	5
0	2
1	– 1
2	– 4

$y = -3x + 2$
$= -3(-2) + 2$
$= \mathbf{8}$

$y = -3x + 2$
$= -3(-1) + 2$
$= \mathbf{5}$

$y = -3x + 2$
$= -3(0) + 2$
$= \mathbf{2}$

$y = -3x + 2$
$= -3(1) + 2$
$= \mathbf{-1}$



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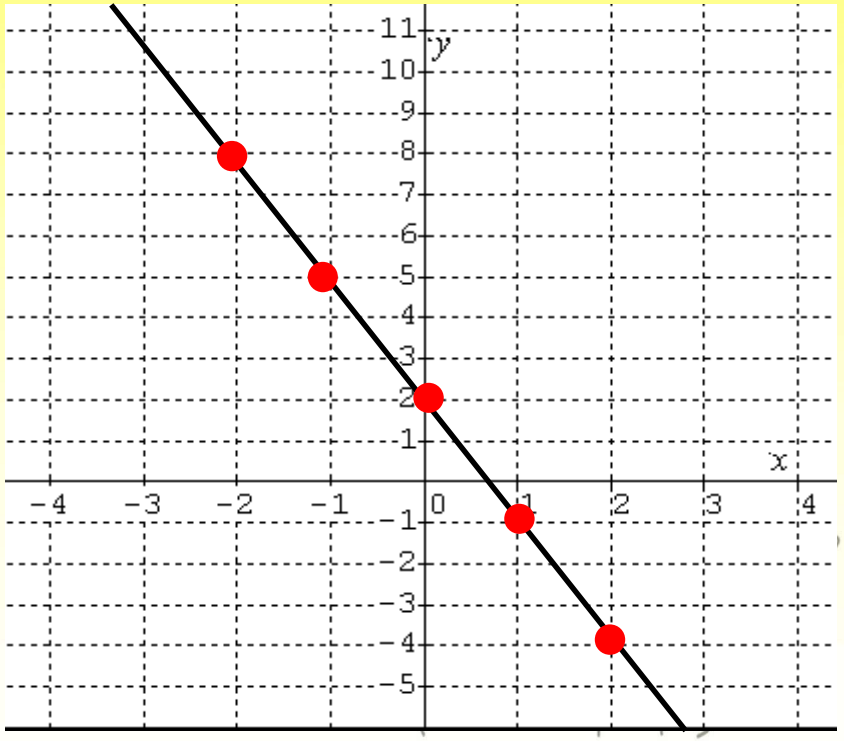
EXAMPLE 3 *Calculate the Slope for a Given Equation*

For the line **y = – 3x + 2**,

(a) Complete the table below and graph the line

x	y	
– 2	8	(– 2, 8)
– 1	5	(– 1, 5)
0	2	(0, 2)
1	– 1	(1, – 1)
2	– 4	(2, – 4)



y = – 3x + 2

CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 3 *Calculate the Slope for a Given Equation*

For the line **y = – 3x + 2**,

(b) Pick any two (2) points from the line and find the **slope**. What do you notice about this and the equation?

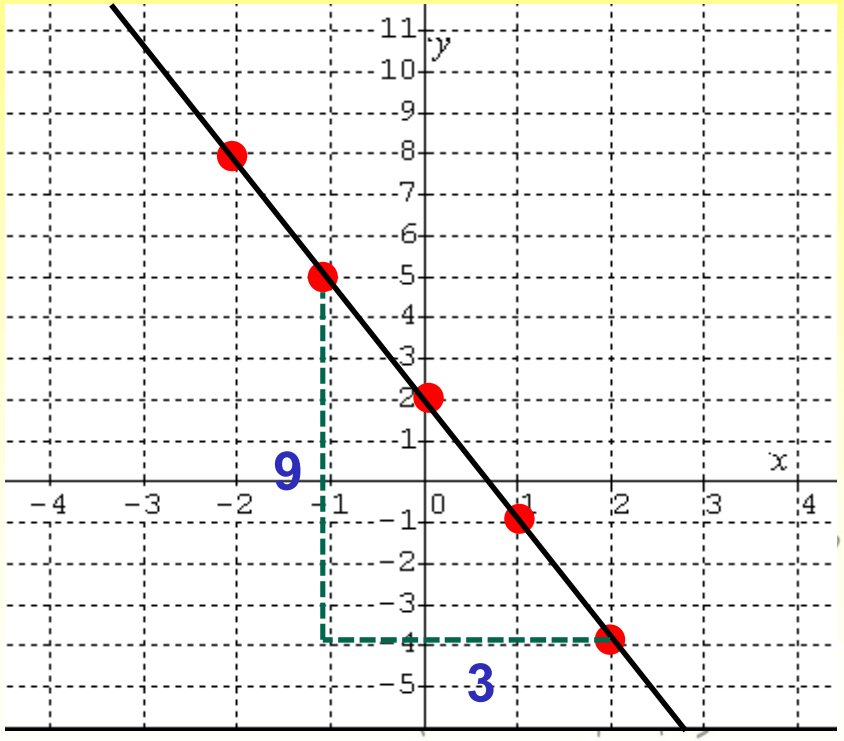
Since the line falls to the right, the slope is **NEGATIVE**

$$slope = \frac{rise}{run}$$

$$slope = -\frac{9}{3}$$

$$slope = -3$$

The slope is the same as the number in front of the *x*



CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 4

Application: Find the Rate of Change in Earnings

Abdul earns **$12 per hour** working at a video store.

(a) Make a table of values showing Abdul's total earnings for **5 hours** of work

# of hours	Pay	Rate of Change
0	0	
1	12	
2	24	
3	36	
4	48	
5	60	

12 x 0 = **0**

12 x 1 = **12**

12 x 2 = **24**

We have to multiply the # of hours by the hourly wage

CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 4

Application: Find the Rate of Change in Earnings

Abdul earns **$12 per hour** working at a video store.

(b) Use the table above to determine the **rate of change** of Abdul's earnings

# of hours	Pay	Rate of Change
0	0	
		12
1	12	
		12
2	24	
		12
3	36	
		12
4	48	
		12
5	60	

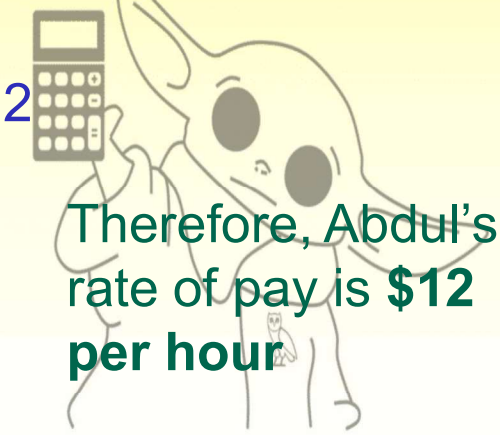
12 – 0 = **12**

24 – 12 = **12**

36 – 24 = **12**

We have to subtract the successive *y*-values (the Pay)

Therefore, Abdul's rate of pay is **$12 per hour**



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CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

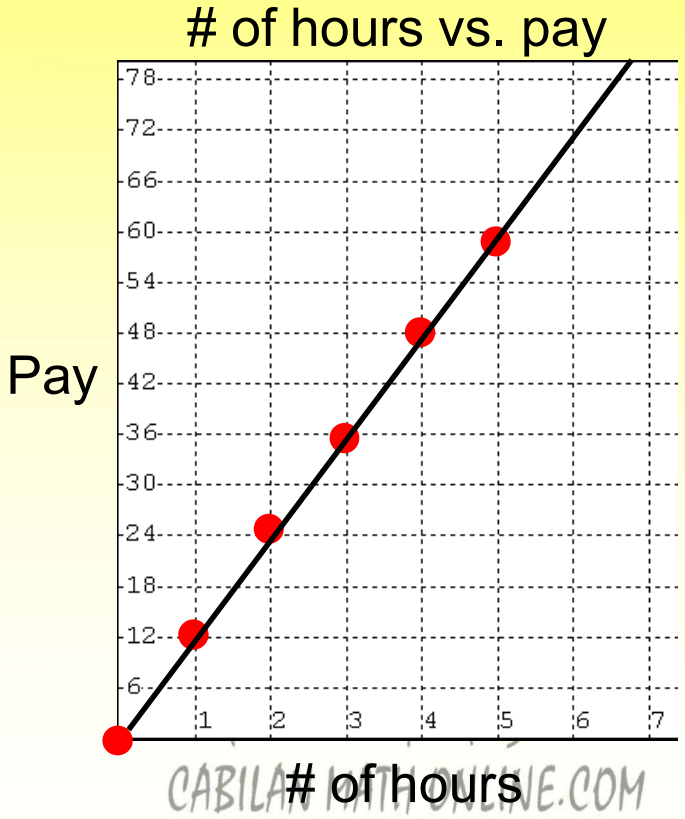
EXAMPLE 4

Application: Find the Rate of Change in Earnings

Abdul earns **$12 per hour** working at a video store.

(c) Graph Abdul's earnings. Label all axes.

# of hours	Pay	Rate of Change
0	0	
1	12	
2	24	
3	36	
4	48	
5	60	



CHAPTER 3.1 SLOPE AS A RATE OF CHANGE

EXAMPLE 4

Application: Find the Rate of Change in Earnings

Abdul earns **$12 per hour** working at a video store.

(d) Pick <u>any two (2) points</u> and calculate the **slope**.
What do you notice about this slope and your answer from (b)?

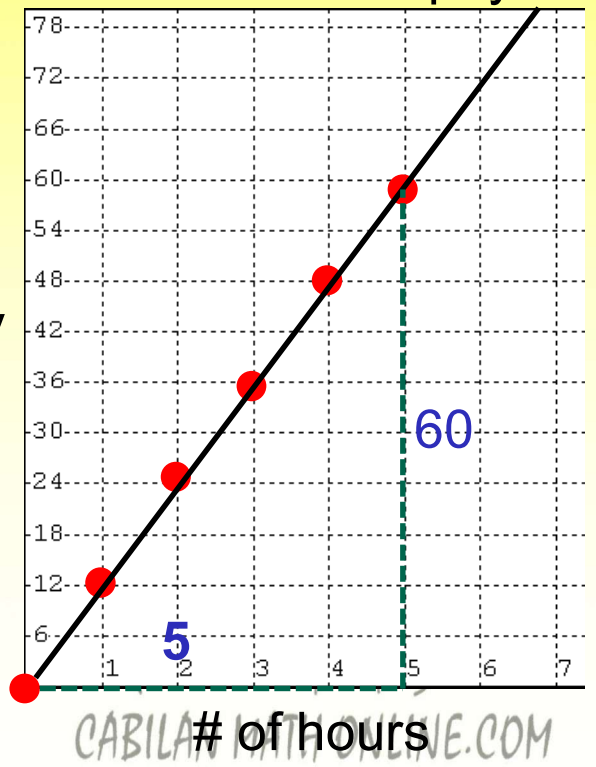
$$slope = \frac{rise}{run}$$

$$slope = \frac{60}{5}$$

$$\boxed{slope = 12}$$

The *slope* and answer from (b) are the <u>same</u>
→ **SLOPE = RATE OF CHANGE**

# of hours vs. pay



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Application: Find the Rate of Change in Earnings

Abdul earns **$12 per hour** working at a video store.

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What do you notice about this slope and your answer from (b)?

<u>Alternate solution</u>

$$slope = \frac{rise}{run}$$

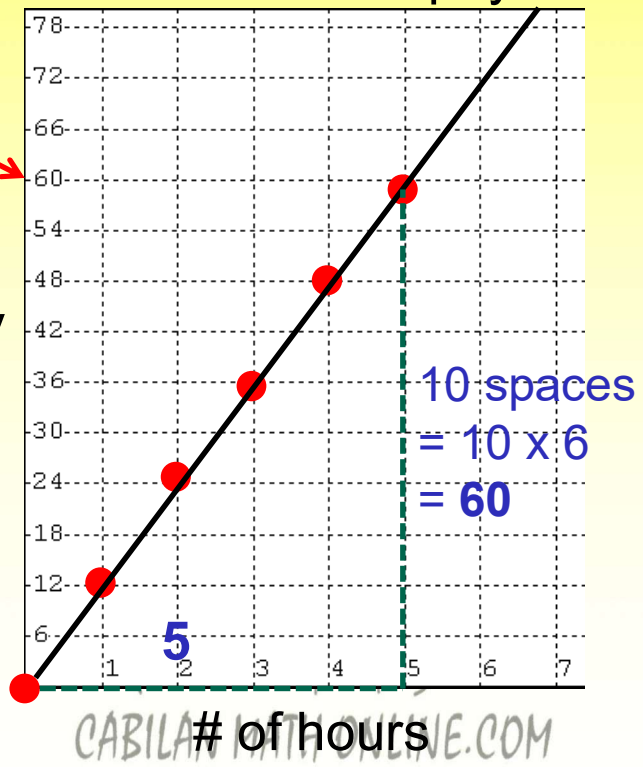
$$slope = \frac{60}{5}$$

$$\boxed{slope = 12}$$

Each space is going **<u>up by 6</u>**

The *slope* and answer from (b) are the <u>same</u> → **SLOPE = RATE OF CHANGE**

# of hours vs. pay



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Homework:

Page 106 – 109

#1 – 10, 12, *11