

## 8 Algebra CC

**Essential Question:** How can we represent linear relationships symbolically given a table of values or verbal description?

part of earnings

**Do Now:** Craig is saving to buy an MP3 player. His parents provide him with a weekly allowance of \$10. He also earns money from mowing his neighbor's lawns. He charges \$20 per lawn.

a) Complete the table below that represents Craig's earnings ( $y$ ) in one week after mowing  $x$  lawns.

Number of Lawns ( $x$ )	0	1	2	3	4	5
Earnings ( $y$ )	10	30	50	70	90	110

b) Write an equation that represents Craig's weekly income.

total income  $\rightarrow y = 20x + 10$   
 $\swarrow$  \$20 per lawn  $\nwarrow$  initial amount (allowance)

## Modeling Linear Relationships

1) Tom works at an aquarium shop on Saturdays. One Saturday, he is asked to clean one of the tanks. Before cleaning the tank, he has to transfer the fish into another tank and then drain the tank. In order to drain the tank, he puts a hose into the tank and starts a siphon. The table below represents the relationship between the gallons of water remaining in the tank ( $y$ ) after  $x$  hours.

X Time (hours)	0	1	2	3	4	5	6	7
Y Water (gallons)	175	150	125	100	75	50	25	0

a) Identify the  $x$  and  $y$ -intercepts in the table. Explain their meaning in the context of the situation.

$x$  intercept:  $y$  value is 0

(7, 0)  
hours gallons of water

In 7 hours, there is no more water in the tank

$y$  intercept:  $x$  value is 0

(0, 175)  
hours gallons of water  
Initially (at the beginning)

b) Write an equation that represents the relationship displayed by the table. What does the rate of change tell us?

ROC (rate of change)

$x_1, y_1$   $x_2, y_2$   
(3, 100) (2, 125)

$$\frac{\Delta y}{\Delta x} = \frac{100 - 125}{3 - 2} \rightarrow \frac{-25}{1} \text{ gallons per hour}$$

equation:  $y = mx + b$   
 $y = -25x + 175$

tank had 175 gallons of water in it.

The tank is being drained at a rate of 25 gallons of water per hour.

- 2) Pictured below are two receipts from Super Clean Car Wash. There is a linear relationship that exists between the charge and the time spent (in minutes) to wash a car.

SUPER CLEAN CAR WASH	
Date:	12 - 2 - 13
Start Time:	01:55 pm
Stop Time:	02:05 pm
Charge:	\$7.00

} 10 min  
→ (10, 7) minutes ↙ \$

SUPER CLEAN CAR WASH	
Date:	12 - 7 - 13
Start Time:	09:30 am
Stop Time:	09:50 am
Charge:	\$12.00

} 20 minutes  
→ (20, 12) minutes ↙ \$

Write a linear equation relating the time it takes ( $x$ ) and the charge incurred ( $y$ ) by a person getting his/her car washed at Super Clean. What does the slope and  $y$ -intercept represent in your equation?

(10, 7) (20, 12)

$$\frac{\Delta y}{\Delta x} = \frac{7-12}{10-20}$$

$$= \frac{-5}{-10}$$

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

y intercept  
 $y = mx + b$   
 $12 = \frac{1}{2}(20) + b$   
 $12 = 10 + b$   
 $2 = b$

total charge →  $y = \frac{1}{2}x + 2$

↑ slope  
It costs 50¢ per minute to wash your car

↑ y intercept  
there is an initial fee of \$2 to use the car wash

- 3) A truck driver is traveling from Sacramento to Reno. After 1 hour, the driver is 84 miles from Reno. After 2 hours, the driver is 36 miles from Reno. Write a linear equation that relates the time passed since leaving Sacramento to the driver's distance from Reno. Explain the meaning of the slope and  $y$ -intercept in your equation.

(1, 84) (2, 36)

hrs ↑ miles      hours ↑ miles

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{84-36}{1-2}$$

$$= \frac{48}{-1}$$

$$= -48$$

y intercept  
 $y = mx + b$   
 $36 = -48(2) + b$   
 $36 = -96 + b$   
 $+96 \quad +96$   
 $132 = b$

number of miles from Reno →  $y = -48x + 132$

↑ the driver is 48 miles closer to Reno every hour (slope)

↑ the driver started at 132 miles from Reno (y intercept)