1. Suppose that the water level of a river is 34 feet and that it is receding at a rate of 0.5 foot per day. Find the slope, including units, and write a sentence to interpret the slope in detail. Write an equation for the water level, \( L \), after \( d \) days. In how many days will the water level be 26 feet?

\[
L = 34 - 0.5d
\]

plug in \( L = 26 \)

\[
26 = 34 - 0.5d
\]

\[
d = 16
\]

The water level will be at 26 feet after 16 days.

Slope:
\[
m = -0.5 \text{ ft/day}
\]

For every day that passes, the water level will decrease by 0.5 feet.

y-intercept: 34

\((0,34)\)

After 0 days have passed, the water level will be 34 feet high. The initial height of the river was 34 feet.

2. For babysitting, Nicole charges a flat fee of $3, plus $5 per hour. Write an equation for the cost, \( C \), after \( h \) hours of babysitting. What do you think the slope and the y-intercept represent? How much money will she make if she baby-sits 5 hours?

\[
C = 3 + 5h
\]

plug in \( h = 5 \)

\[
C = 3 + 5(5) = 28
\]

Nicole will make $28 if she baby-sits for 5 hours.

Slope:
\[
m = 5 \text{ $/hr} \quad \text{or} \quad m = 5\text {$/hr}
\]

For every hour Nicole baby-sits, she will make an additional $5.00.

y-intercept: 3

\((0,3)\)

If Nicole baby-sits someone for 0 hours, she will make $3.00. This is her flat fee for babysitting.
3. In order to “curve” a set of test scores, a teacher uses the equation 
\[ y = 2.5x + 10, \] 
where \( y \) is the curved test score and \( x \) is the number of problems answered correctly. Find the test score of a student who answers 32 problems correctly. Explain what the slope and the \( y \)-intercept mean in the equation.

\[ y = 2.5x + 10 \]
plug in \( x = 32 \)
\[ y = 2.5(32) + 10 = 90 \]

**Slope:**
\[ m = 2.5 \text{ (curved test score) / (correct answer)} \]
For every 1 correct answer, your score will increase by 2.5.

**\( y \)-intercept:** 10
(0,10)
This tells us that if a student got no answers correct on the test, they will still receive a test score of 10.

4. A plumber charges $25 for a service call plus $50 per hour of service. Find the slope, including units, and write a sentence to interpret the slope in detail. Write a linear equation for the cost, \( C \), after \( h \) hours of service.

\[ C = 25 + 50h \]

**Slope:**
\[ m = 50 \text{ $/hr or } m = 50/\text{hr} \]
For every 1 hour of service the plumber provides, the plumbers charge increases by $50.00.

**\( y \)-intercept:** 25
(0,25)
This says that if a plumber shows up and works for zero hours, he still charges $25.00.
5. Rufus collected 100 pounds of aluminum cans to recycle. He plans to collect an additional 25 pounds each week. Write and graph the equation for the total pounds, \( P \), of aluminum cans after \( w \) weeks. What does the slope and \( y \)-intercept represent? How long will it take Rufus to collect 400 pounds of cans?

\[
P = 100 + 25w
\]

plug in \( P = 400 \)

\[
400 = 100 + 25w
\]

\( w = 12 \)

It will take Rufus 12 weeks to gather 400 lbs. of aluminum cans to recycle.

Slope:
\( m = 25 \text{ lbs./week} \)
For every week that goes by, Rufus increases the amount of aluminum cans he collects by 100 lbs.

\( y \)-intercept: 100
(0,100)
This tells us that Rufus started with 100 pounds of aluminum cans to recycle.

6. A canoe rental service charges a $20 transportation fee and $30 dollars an hour to rent a canoe. Write and graph an equation representing the cost, \( C \), of renting a canoe for \( h \) hours. Find the slope, including units, and write a sentence to interpret the slope in detail.

\[
C = 20 + 30h
\]

Slope:
\( m = 30 \text{ $/hr} \)
For every hour you rent a canoe, your bill increases by $30.00.

\( y \)-intercept: 20
(0,20)
If you rent a canoe for zero hours, you will be charged $20.00. This is the base fee.
7. A caterer charges $120 to cater a party for 15 people and $200 for 25 people. Assume that the cost, y, is a linear function of the number of x people. Write an equation in slope-intercept form for this function. What does the slope represent? How much would a party for 40 people cost?

Write as two points in terms of: (number of people, cost in $)
(15,120) and (25,200)

Find the equation of the line using:
\[m = \frac{y_2 - y_1}{x_2 - x_1}\]
\[y = mx + b\]

Equation:
\[Y = 8x\]

plug in \(x = 40\)
\[y = 8(40) = 320\]
A party of 40 people will cost $320.00.

Slope:
\[m = 8 \frac{\text{\$/person}}{\text{\$}}\]
For every person that attends the party, the caterer’s bill increases by $120.00.

\(y\)-intercept: 0
(0,0)
This tells us that if no one attends the party, the caterer’s bill will be $0.00. So the caterer has no base cost they charge to cater a party.

8. An attorney charges a fixed fee on $250 for an initial meeting and $150 per hour for all hours worked after that. Write a linear equation representation of the cost of hiring this attorney. Find the charge for 26 hours of work.

\[C = 250 + 150h\]

Options to clarify your solutions:
Option 1:
Assuming the initial meeting counts for the 1st hour, you would plug in \(h = 25\) for a total cost of $4000.00.

Option 2:
Assuming the initial meeting does not count for the 1st hour, you would plug in \(h = 26\) for a total cost of $4150.00.

Slope:
\[m = 150 \frac{\text{\$/week}}{}\]
For every 1 hour increase your attorney works, your cost or bill increases by $150.00.

\(y\)-intercept: 250
(0,250)
If you meet your attorney and he works zero hours, your cost will be $250.00. This is the attorney’s base fee.
9. A water tank already contains 55 gallons of water when Baxter begins to fill it. Water flows into the tank at a rate of 8 gallons per minute. Write a linear equation to model this situation. Find the volume of water in the tank 25 minutes after Baxter begins filling the tank.

\[ V = 55 + 8m \]

plug in \( m = 25 \)
\[ V = 55 + 8(25) = 255 \]

25 minutes after Baxter begins filling the tank, the volume of water in the tank will be 255 gallons.

**Slope:**
m = 8 gal/min
For every min the water is on, the volume of water in the tank increases by 55 gallons.

**y-intercept:** 55
(0,55)
The initial volume of water in the tank was 55 gallons.

10. A video rental store charges an initial $20 membership fee and $2.50 for each video rented. Write and graph a linear equation to model this situation. If 15 videos are rented, what is the revenue? If a new member paid the store $67.50 in the last 3 months, how many videos were rented?

\[ C = 20 + 2.50v \]

plug in \( C = 67.50 \)
\[ 67.50 = 20 + 2.50v \]
\[ v = 19 \]
In the past 3 months, the new member rented 19 videos.

**Slope:**
m = 2.50 $/video
For every one video a member rents, their bill increases by $2.50.

**y-intercept:** 20
(0,20)
A new member who rents zero videos will still be charged $20.00. This is the initial membership fee.
11. Casey has a small business making dessert baskets. She estimates that her fixed weekly costs for rent and electricity are $200. The ingredients for one dessert basket cost $2.50. If Casey made 40 baskets this past week, what were her total weekly costs? Her total costs for the week before were $562.50. How many dessert baskets did she make the week before?

\[ C = 200 + 2.50b \]

plug in \( b = 40 \)
\[ C = 200 + 2.50(40) = 300 \]
If Casey made 40 baskets, her costs would be $300.00.

plug in \( C = 562.50 \)
\[ 562.50 = 200 + 2.50b \]
\[ b = 145 \]
In the past 3 months, the new member rented 19 videos.

Slope:
\[ m = 2.50 \text{ $/video} \]
For every one video a member rents, their bill increases by $2.50.

y-intercept: 20
(0,20)
A new member who rents zero videos will still be charged $20.00. This is the initial membership fee.

12. Tim buys a snow thrower for $1200. For tax purposes, he declares a linear depreciation (loss of value) of $200 per year. Let \( y \) be the declared value of the snow thrower after \( x \) years.

a. What is the slope of the line that models this depreciation?

\[ m = -200 \text{ $/yr} \]
This tells us that for every year that passes, the value of the snow thrower decreases by $200.00.

b. What is the \( y \)-intercept of the line.

The \( y \)-intercept is 1200. This tells us that the initial value of Tim's snow thrower was $1200.00.
c. Write a linear equation in slope-intercept form to model the value of the snow thrower over time.

\[ y = -200x + 1200 \]

or

\[ V = -200x + 1200 \]

d. What is a reasonable domain for this function?

\[ 0 \leq x \leq 6 \]

We did not discuss domains. There will be no domain questions on the exam.

e. Find the value of the snow thrower after 4.5 years.

Plug in \( x = 4.5 \)

\[ Y = -200(4.5) + 1200 = 300 \]

After 4.5 years, Tim's snow thrower is worth $300.00.