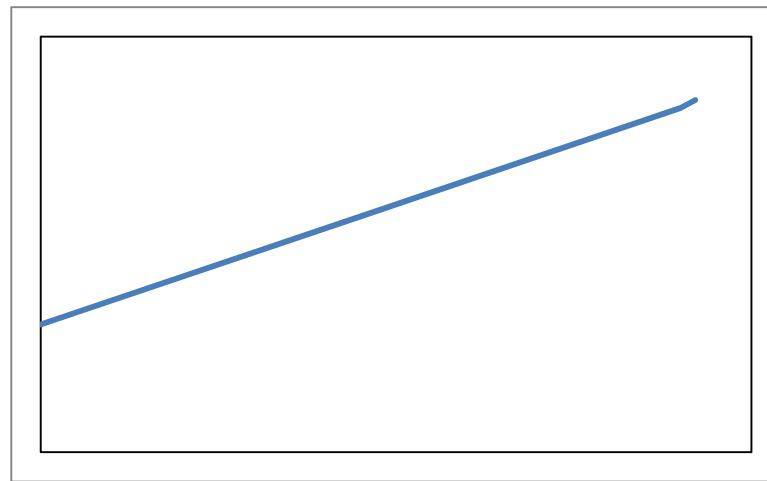
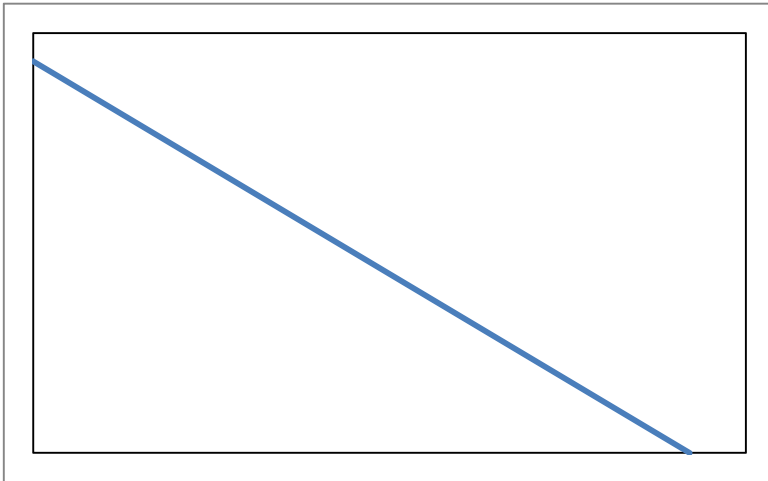


Task: Sally's Car Loan

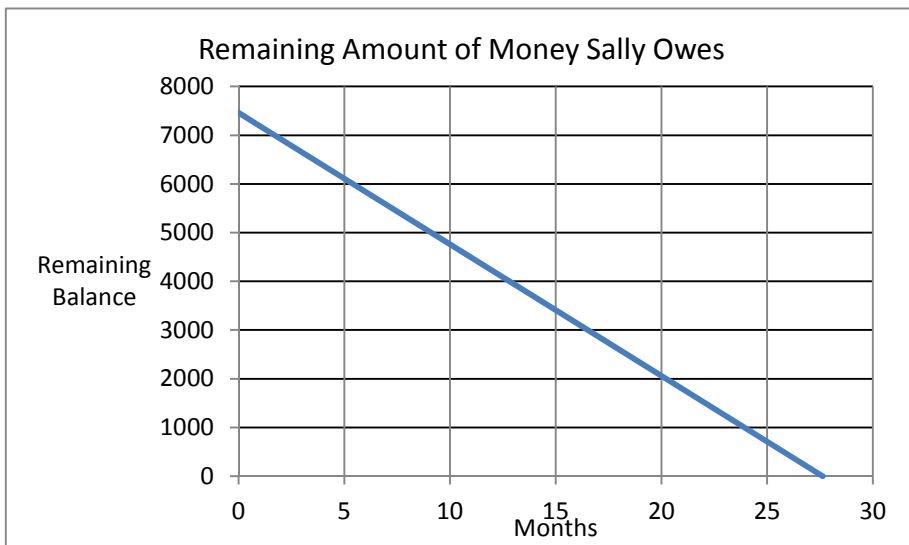
Sally bought a new car. Her total cost including all fees and taxes was \$15,000. She made a down payment of \$4300. She financed the remaining amount with no interest. Sally is going to pay off the remainder of the loan using equal monthly payments.

- After 12 monthly payments, Sally has a remaining balance of \$7460. How many months will it take for Sally to pay off the loan? Show how you decided.
- Both of the first quadrant graphs below could be used to represent Sally's situation. Title, scale, and label the axes on each graph so that the graph makes sense in terms of Sally's situation. Address key aspects of the graph, such as the intercepts and the slope as they relate to Sally's situation.

**Teacher Notes:**

- The teacher may need to explain the statement "She financed the remaining balance with no interest."
- Question A has two possible answers. It asks how many months will it take her to pay off the loan? Some students will answer this by saying the total number of months, while some will say the number of months past 12. This is an opportune time to talk about justifying your answer based on the assumptions made.
- Another part of question a is the fact that the number of payments does not come out to an exact answer. Students need to discuss that even though Sally is paying \$270 per month, the last payment would not be as much.
- In Part B teachers may need to provide graphs with some gridlines if students really struggle. There are some included at the end of the task that you can insert.

Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
<p>8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</p> <p>8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.</p>	<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Essential Understandings	
<ul style="list-style-type: none"> • Functions provide a tool for describing how variables change together. Using a function in this way is called modeling, and the function is called a model. • Functions can be represented in multiple ways—in algebraic symbols, situations, graphs, verbal descriptions, tables, and so on—and these representations, and the links among them, are useful in analyzing patterns of change. • Some representations of a function may be more useful than others, depending on how they are used. • Linear functions have constant rates of change. 	
Explore Phase	
Possible Solution Paths	Assessing and Advancing Questions
<p>a) Students could subtract $\\$4300$ from $\\$15000 = \\10700 They know that in 12 months the balance went from $\\$10700$ to $\\$7460$, a difference of $\\$3240$. $\\$3240/12$ months = $\\$270$ per month</p> <p>$\\$7460/270 = 27.63$ months</p> <p>or</p> <p>$\\$10,700/270 = 39.63$ months</p> <p>(Students could use equations to do the work above)</p> <p>$10,700 - 7460 = 12x$ to find the payment. This is the same work done as above, just in equation form.</p>	<p>Assessing – How did you know to subtract $\\$4300$ from $\\$15000$? How did you come up with $\\$270$ per month?</p> <p>Advancing – How many months total did it take for her to pay off the car? Would she make the $\\$270$ payment every month? What does 27.63 months mean?</p> <p>Assessing – Why did you divide 10700 by 270 and not 7460?</p> <p>Advancing – How many months total did it take for her to pay off the car? Would she make the $\\$270$ payment every month? What does 39.63 months mean?</p>

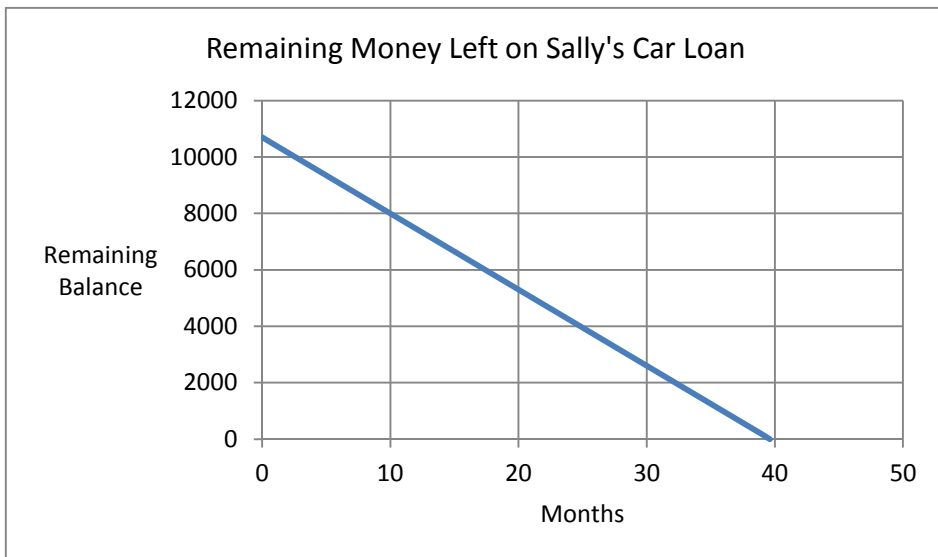


Intercepts (0,7460) represents the balance after 12 months

(27.6, 0) represents when the loan is paid off

Slope = -270 this represents the monthly payment. It is negative because the remaining balance goes down each month she makes the payment.

or



Assessing – How did you know what the intercepts where? How did you know what the slope is?

Advancing – Can you identify an ordered pair on the graph? If this graph is extended into Quadrant 2, what will the ordered pair be when $x = -1$? Does this make sense in this problem?

Assessing – How did you know what the intercepts where? How did you know what the slope is?

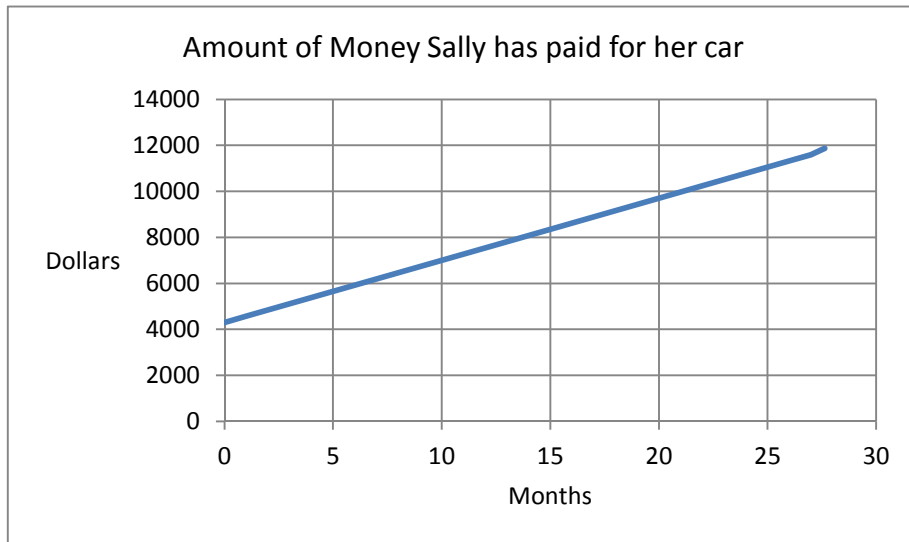
Advancing – Can you identify an ordered pair on the graph? If this graph is extended into Quadrant 4, what will the ordered pair be when $x = 40$? Does this make sense in this problem?

Intercepts (0, 10700) Amount left to pay after down payment

(39.63, 0) Number of months to pay off the loan

Slope = -270 this represents the monthly payment. It is negative because the remaining balance goes down each month she makes the payment.

(In either of the 2 graphs above students could do years for the horizontal axis instead of months.)



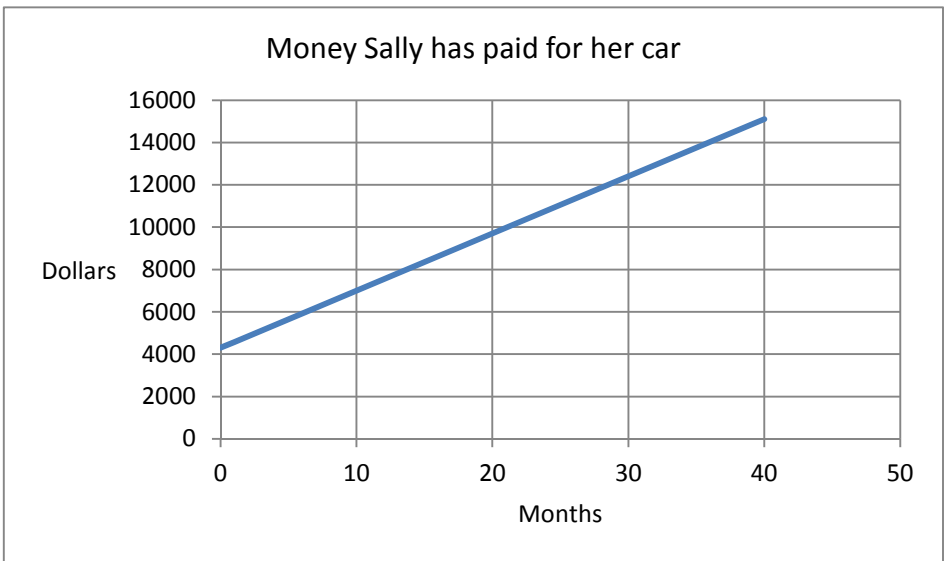
Intercepts (0, 4300) Amount of down payment

Slope = 270 this represents the monthly payment. It is positive because this adds to the amount of money Sally has paid..

Or

Assessing – How did you know what the intercepts were? How did you know what the slope is?

Advancing – Can you identify an ordered pair on the graph? What would change about the situation if the y-intercept was 5000?



Assessing – How did you know what the intercepts were? How did you know what the slope is?

Advancing – Can you identify an ordered pair on the graph? What would change about the situation if the y-intercept was 5000?

Intercepts (0, 4300) Amount of down payment

Slope = 270 this represents the monthly payment. It is positive because this adds to the amount of money she has paid for the car.

Possible Student Misconceptions

a) Students may blindly divide \$7460 by 12 to try and calculate the monthly payment. $7460/12 = \$621.67$

Assessing - What does the 12 represent? What does 7460 represent?

Advancing - What should we divide by 12 to get the correct monthly payment?

b) Students may get confused on what should go on each axis.

Assessing - What is happening to the amount of money that Sally owes? That she pays?

Advancing - Could a table help the graph make more sense to us? What numbers should we put in our table to help us?

Entry/Extensions

Assessing and Advancing Questions

If students can't get started....

Assessing – How much was the car? How much money did Sally pay for a down payment? How much does she owe when she drives off the lot? How much did she pay off in the first 12 months?

	Advancing - How can we use this to help us with how long it will take her to pay off the car?
If students finish early....	Assessing – Are these the only two possible graphs? Advancing – Come up with another graph that would work for this situation. Follow the directions for part B.
Discuss/Analyze	
Whole Group Questions	
a) Is the correct answer 27.63 or 39.63 months? Can you round off your answer in this problem? What is the meaning of the decimal part of your answer? What would the last payment be? What if the problem had talked about Sally paying 4% interest on the amount she borrowed?	
b) How can there be a line with positive slope and a line with negative slope that can represent this situation? Can you come up with equations of lines for the two equations? Find a way to verify that these equations are correct.	

