

Renting Cars, Stealing Money, and Linear Functions

Summary	
<p>In this lesson, students compare the pricing plans for two car rental companies. They use the pricing plans to create two linear functions. They look at the functions graphically, algebraically and graphically.</p>	
Utah State Core Standard	
<p>Standard 2, Objective 2.2 Evaluate, solve, and analyze mathematical situations using algebraic properties and symbols. Solve systems of equations with no more than three variables using technology.</p>	
Desired Results	
Benchmark/Enduring Understanding	
<p>Students can interpret graphs and understand linear functions algebraically, numerically and graphically.</p>	
Essential Questions	Skills
<ul style="list-style-type: none"> • What is the meaning of the slope? • What is the interpretation of the y-intercept in problem situations? • What does the intersection of two graphs mean? 	<p>Writing the equation of a line given a verbal or graphical representation.</p>
Assessment Evidence	
<p>Question #13 and the writing prompt included in this lesson are intended to assess student understanding of the slope, the y-intercept, and the intersection between the two lines. These two items also assess students' ability to write and graph linear functions. The "Shifting Funds Investigation" could be used as a performance assessment.</p>	
Instructional Activities	
<p>Launch: Activate students' background knowledge relating to renting cars. Explore: Students work on worksheet problems 1-12, either individually or in groups. Summarize:</p> <ul style="list-style-type: none"> • Students work in groups to create a poster describing their plans for problem #13. Groups present their plans to the class. • Students individually write their response to the writing and prompt. <p>The "Shifting Funds Investigation" can be used as a second activity to extend and solidify the concepts learned in the Car Rental lesson, or as a performance assessment.</p>	
Materials Needed	
<p>Copies of worksheets Graphing calculators (optional, but strongly suggested)</p>	

Hurts Car company charges \$25.20 for a daily rental plus \$.60 per mile. Rent-A-Wreck car company charges a flat rate of \$42 for the same model car.

1. Fill in the following tables:

Hurts

Miles	Calculations	Cost $H(x)$
5		
50		
100		
x		

Rent-A-Wreck

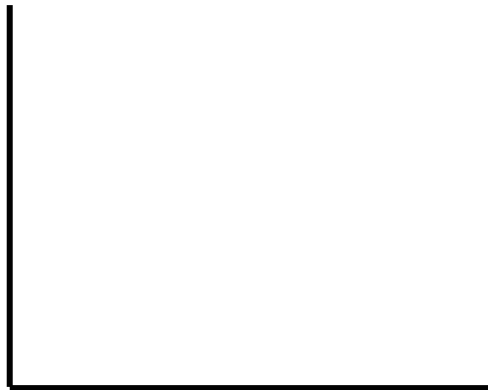
Miles	Calculations	Cost $R(x)$
x		

2. Write the equations for each company when traveling x miles.

$$H(x) =$$

$$R(x) =$$

3. Graph and label Hurts $H(x)$ and Rent-a-Wreck $R(x)$ on the same coordinate system. Label the independent and dependent variables.



4. What is the slope (rate of change) for each company's pricing plan?
5. What does the slope **represent** for each company? (Write this in a sentence.)
6. What is the y-intercept for each company's pricing plan? (Don't forget that the y-intercept should be written as a point.)
7. What does the y-intercept **represent** for each company? (Write this in a sentence.)
8. How many miles would you have traveled, renting from Hurts, if the final cost (before taxes) is \$35.40?
9. If you travel 30 miles, what would be the cost renting from
Hurts? _____ Rent-A-Wreck? _____
10. For what situation is Hurts better?
11. For what situation is Rent-A-Wreck better?
12. After how many miles will the prices be the same?
13. Make up two price plans where the cars would be the same cost at 130 miles. Both plans must include a charge for mileage. Represent the two price plans both algebraically and graphically.

Writing assignment:

You are the business consultant to the Hurts Car Company. Your job is to present the two price plans, Hurts and Rent a Wreck, to the management team. Your presentation should include an explanation of how the two plans affect the customer and how the company might benefit or lose from the two plans. How might each plan affect sales? How might each plan affect overall profit?

Extra for Experts:

1. Imagine that you have an odometer that can record negative miles if the car is in reverse. Hurts charges the same fees for going in reverse as they do for a car going forward. On the same graph, plot the charges for a rented car that goes in reverse for 20 miles and another car that goes forward for twenty miles.

2. Imagine that Hurts charges the same $\$25.20 + \0.60 per mile rate, except that the mileage is rounded so that renters pay $\$0.60$ for the first 0.5 - 1.4 miles and then an additional $\$0.60$ if they go 1.5-2.4 miles, and so on. Graph this situation for the first ten miles.

Shifting Funds Investigation

Carlotta "Lotta" Doe has \$2000 in a savings account, while Les Cache has only \$470 in his account. Criminal Hollie Hacker gains access to the bank's computer and begins to shift funds around. On the first night, she creates a new account for herself. She takes \$50 from Carlotta's account and puts \$40 into Les' account and the remaining \$10 is shifted into her own account. Each night after that, she makes the same monetary shifts.

1. Determine the independent and dependent variables.
2. Set up tables for the independent variable, Hollie, Les, and Carlotta.

Indep. Var.	Hollie	Les	Carlotta
x			

3. Set up the equations for each person's bank account in your calculator, then graph. Be sure to adjust your window.

4. Sketch all three lines on a graph below. Be sure to label axes and state window.



Solve the following problems numerically (using tables), algebraically and graphically.

5. How many nights did Hollie work until Les had more money than Carlotta ?

6. When will Les have \$630 ?

7. How much money will Carlotta have on day 7?

Solve using any method. Explain your reasoning.

8. Hollie was arrested the night that Les's balance first became more than twice Carlotta's balance. How much was in Hollie's account the night she was arrested?

