LESSON

Percent Decrease

A CASHIER'S QUANDARY

Sherman's Department Store ran the following ad in the newspaper.

3-HOUR EARLY-BIRD SPECIAL!

★ ★ ★ ★ ★

This week, all merchandise has been discounted 30% for our year-end clearance sale.

For three hours only, from 9AM to 12 noon on Saturday, get amazing additional savings! We will take an **additional** 20% off the sale price at the cash register.

G.D. and Cal were working during the three-hour sale. At the end of the sale, they compared receipts and discovered that they had sold some of the same items, but they had charged customers different prices for them. They made the following table.

Original price	Cal charged	G.D. charged
$139.99	$78.39	$70.00
$49.95	$27.97	$24.98
$18.89	$10.57	$9.44
$5.29	$2.96	$2.65
$179.00	$100.24	$89.50

1. **Exploration** How was Cal calculating the sale price? How was G.D. calculating the sale price? Explain, showing sample calculations. Who do you think was right, and why?

LATE PAPER POLICIES

Mr. Peters, an algebra teacher, has a *10% off* late paper policy. This means that for each day that a paper is late, the student receives 90% of the credit that he or she would have received the day before. For example, if you turned in a perfect paper (assume a score out of 100) one day late, you would receive $(0.90)(100) = 90$ as your score. If you turned the paper in two days late, you would receive $(0.90)(90) = 81$ as your score.

2. Copy and extend Mr. Peters's table to show the score you would receive on a perfect paper that is up to ten days late.

Mr. Peters's Late Policy

Days late	Score
0	100
1	90
2	81

3. a. Explain how you figured out the scores in the table. Show some sample calculations.
   b. After how many days would your score for a late paper drop below 50?
   c. Would your score ever reach 0? Explain.

Mr. Riley, another algebra teacher, has a *10 points off* policy. This means that you lose ten points for each day that your paper is late.

4. Copy and extend Mr. Riley's table to show the score you would receive on a perfect paper that is up to ten days late.

Mr. Riley's Late Policy

Days late	Score
0	100
1	90
2	80

5. a After how many days would your score for a late paper drop below 50?

b. Would your score ever reach 0? Explain.

6. Graph the data in the two tables showing how the score decreases as a function of the number of days late. Use the same axes for both graphs so that you can compare them.

7. ⟜ Write an equation that gives your score (S) on a perfect paper as a function of the number of days late (D)

a. in Mr. Peters's class;

b. in Mr. Riley's class.

8. ⟜

a. One of the equations you wrote in problem 7 should have an exponent. (If it doesn't, check your work.) Which equation has an exponent, the *percent off* policy, or the *points off* policy?

b. Write each equation you wrote in problem 7 on the corresponding graph. Does the equation containing an exponent correspond to the straight graph or to the curved graph?

9. Compare Mr. Riley's policy with Mr. Peters's policy. Which one do you prefer, and why? Give reasons why some students might prefer one policy and some students another.

DISCOUNTER INTRODUCES REDUCTIONS!

A store offers a 5% discount to students. If something costs $15.00 after the discount is taken, how much does it cost without the discount? You can use percent decrease and algebra to solve this problem. If the price before the discount is x, and the decrease due to the discount is $0.05x$, then

$$x - 0.05x = \$15.00.$$

10. ⟜ Remember that x can be written $1x$.

a. Combine like terms on the left side of the equation. (Or factor the x.)

b. Then solve for x.

11. Solve for x.

a. $0.2x = 240$

b. $x - 0.8x = 18.2$

c. $x - 0.06x = 23.50$

d. $x - 0.75x = 22.5$

12. Solve for x.

a. $(0.75)(0.75)x = 11.25$

b. $(0.65)^3 x = 4.12$

Look back at the ad for Sherman's Store.

13. a. If the clearance sale price is $13.50, what was the original price, before the 30% discount?

b. If the original price was $20.95, what is the 30% discount price?

14. Report Let x be the original price of an item. Write two algebraic expressions for the early-bird price, one that will give the amount Cal would charge, and one for the amount G.D. would charge. Explain how you figured out these two expressions. Show that they work, by substituting the prices from the table into the expression.

REVIEW *RATE OF CHANGE*

15. Find a function $y = mx + b$ for which

a. y increases when x increases;

b. y increases when x decreases;

c. y never increases.

16. Find a function $y = mx + b$, with m positive, for which y changes

a. faster than x;

b. more slowly than x;

c. at the same rate as x.

17. $\bigcirc\!\!\!/\ y = x^7$ and $y = 2^x$ are having a race. When $x = 1$, $x^7 = 1$ and $2^x = 2$, so $y = 2^x$ is ahead. When $x = 3$, $x^7 = 2187$ and $2^x = 8$, so $y = x^7$ is ahead. As x gets larger and larger, who will win the race? Use your calculators and make a table to find out.