



### Activity Overview

In this activity, students will find discounts and sale prices for items selling at 20% off and 40% off by using tables. They will then find the general rules, using a variable, for finding those discounts and prices.

### Topic: Numbers, Algebra

- Percents, discounts
- Patterns, tables

### Teacher Preparation and Notes

- Students should have some experience with finding percents before this activity but prior knowledge of making tables on the TI-84 Plus is not necessary.
- To download the student worksheet, go to [education.ti.com/exchange/csp](http://education.ti.com/exchange/csp)

Mode	Result
$.20 * 30$	6
$\frac{20}{100} * 30$	6
$(20 * 30) / 100$	6

This activity utilizes MathPrint™ functionality and includes screen captures taken from the TI-84 Plus C Silver Edition. It is also appropriate for use with the TI-83 Plus, TI-84 Plus, and TI-84 Plus Silver Edition but slight variances may be found within the directions.

#### Compatible Devices:

- TI-84 Plus Family
- TI-84 Plus C Silver Edition

#### Associated Materials:

- Calculating\_Sale\_Prices\_Student.pdf
- Calculating\_Sale\_Prices\_Student.doc

#### Tech Tips:

- Access free tutorials at <http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials>
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

## Part 1 – A 20% Discount

In this problem, students will explore percent discounts and sale prices. The scenario is a sporting goods store having a sale. Students are to calculate the discount and the associated sale price.

Your students should have some experience with finding percents before attempting this activity. They should also have some experience representing an unknown amount by using a variable. They do not need any experience building and interpreting tables with the TI-84.

Many middle school students persist in finding the sale price for an item by finding the amount of the discount and then subtracting that discount from the original price. For example, to find the sale price for an item that was originally \$80 and is marked down 20%, such students find 20% of \$80 (\$16) and subtract the discount from the original price ( $\$80 - \$16 = \$64$ ).

Building tables can help students discover patterns for such problems. After doing several such tables, students are often led by their classmates to understand that finding 20% of a number and subtracting it from the original amount is equivalent to finding 80% of the original number. They may also come to relate the equations  $y = x - 0.20x$  and  $y = 0.80x$  to the problem.

### Question 1

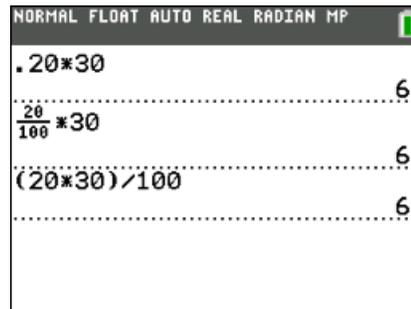
Discuss with students the terms original (or regular) price, percent of discount, discount, and sale price. Have students use the TI-84 Plus to complete the table for 20% off.

The answers can be found by a few different methods on the Home screen. Students can find 20% of the number by converting to a decimal (method 1), by converting to a fraction (method 2) or by solving a proportion (method 3).

Method 1:  $\boxed{.} \boxed{2} \boxed{0} \boxed{\times} \boxed{3} \boxed{0} \boxed{\text{ENTER}}$

Method 2:  $\boxed{\text{ALPHA}} \boxed{[F1]} \boxed{\text{ENTER}} \boxed{2} \boxed{0} \boxed{\downarrow} \boxed{1} \boxed{0} \boxed{0} \boxed{\rightarrow} \boxed{\times} \boxed{3} \boxed{0} \boxed{\text{ENTER}}$

Method 3:  $\boxed{1} \boxed{2} \boxed{0} \boxed{\times} \boxed{3} \boxed{0} \boxed{)} \boxed{\div} \boxed{1} \boxed{0} \boxed{0} \boxed{\text{ENTER}}$

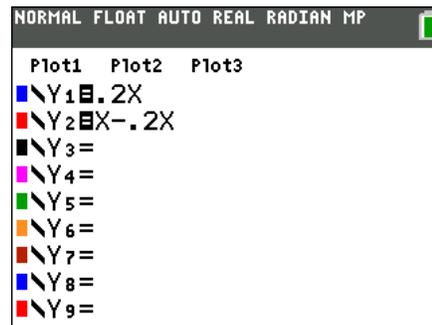


### Questions 2–4

Ask students to give rules, using words, for finding the amount of discount and the sale price for any item during the 20% off sale. This will help lead them to write the equations using variables.

After students have written the equations, have them enter the equation in the Y= editor in order to create a table.

Press  $\boxed{Y=}$  and clear any equations that may be entered. For Y1, press  $\boxed{.} \boxed{2} \boxed{[X,T,\theta,n]} \boxed{\text{ENTER}}$  and for Y2 press  $\boxed{[X,T,\theta,n]} \boxed{-} \boxed{.} \boxed{2} \boxed{[X,T,\theta,n]} \boxed{\text{ENTER}}$



Then, press  $\text{2nd}$  [TBLSET] to access the table setup menu.

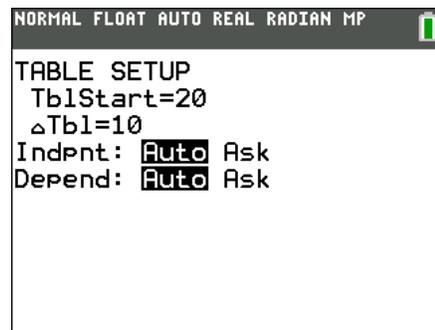
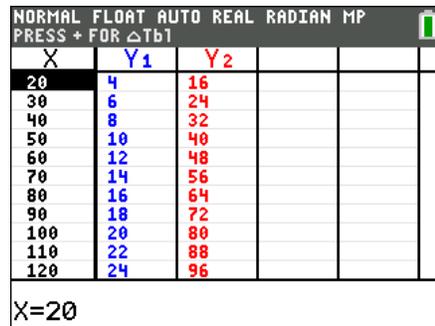
Lead students in a discussion as to the values of the **TblStart** (the first value in their table) and  $\Delta\text{Tbl}$  (the amount the rows in their table increase by).

To display the actual table, press  $\text{2nd}$  [TABLE]. Before students move on in the worksheet, you may want to ask them to interpret some of the values in the table. For example, scroll down to the 14 in the Y1 column and ask them what this number means. Then scroll to the 40 in the Y2 column and ask them to explain what this number means.

### Questions 5–9

After students show that they are comfortable answering questions about the values in the table, have them answer Questions 5-9 on the student worksheet.

Students will find that they cannot answer all the questions with the given table set up. They will need to adjust the table start and table step at some points to find the values needed. Simply press  $\text{2nd}$  [TBLSET] again to change the values and  $\text{2nd}$  [TABLE] to return to the table.

X	Y1	Y2			
20	4	16			
30	6	24			
40	8	32			
50	10	40			
60	12	48			
70	14	56			
80	16	64			
90	18	72			
100	20	80			
110	22	88			
120	24	96			

X=20

## Part 2 – The Sale Gets Greater

In the second problem, the percent discount increases to 40%. Students will simply adjust the equations entered in Y1 and Y2 and display the table again.

### Questions 10–15

The first set of questions is very similar to the questions answered from the 20% sale. Students should feel comfortable moving about the table and adjusting the table set up to find the answers needed.

### Questions 16–17

Students may find the last two questions more challenging. With the patterns explored in the activity, students will hopefully move toward understanding that the discount does not have to first be found before finding the sale price. This may come through natural class discussion or you may have to lead discussion in this direction ultimately.

### Extension

Possible extensions include having students explore 30% or 35% off or have students find sales prices with sales tax included. In Part 1, enter  $Y3 = .8x$  and see that the Y2 and Y3 values in the table are the same. Discuss why.

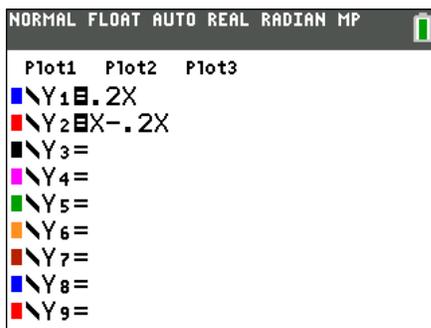
### Solutions – Student Worksheet

#### Part 1

- Using the TI-84 Plus home screen, make a table for the 20 percent off sale. You can enter percent calculations in various ways. These are shown for \$30 at the right.

Original Price	20% off Discount	Sale Price
\$20	\$4	\$16
\$30	\$6	\$24
\$40	\$8	\$32
\$50	\$10	\$40
\$60	\$12	\$48
\$70	\$14	\$56
\$80	\$16	\$64
\$90	\$18	\$72
\$100	\$20	\$80
x (any original price)	0.2x	x – 0.2x

- Write an equation for the amount of the discount. **Answer:  $y = 0.2x$**
- Write an equation for the sale price after the discount. **Answer:  $y = x - 0.2x$ ; Some students may have already discovered that  $y = 0.8x$  is the same amount.**
- Use the TI-84 Plus table feature to make a table for the 20 percent off sale. Enter the “amount of discount” equation in Y1 and the “sale price” equation in Y2. Press **ENTER** to enter the equations.





5. What would the discount be for an item that was originally \$40? **Answer: \$32**
6. What would the sale price be for an item that was originally \$60? **Answer: \$48**
7. What was the original price for an item that is \$72 during the sale? **Answer: \$90**
8. How can you find the sale price for an item that originally cost \$25? **Answer: change  $\Delta Tbl$  to 5**
9. How can you find the sale price for an item that originally cost \$42? **Answer: change  $\Delta Tbl$  to 2 and start at \$40**

## Part 2

10. Now make a table for a 40% off sale.

Original Price	40% off Discount	Sale Price
\$20	<b>\$8</b>	<b>\$12</b>
\$30	<b>\$12</b>	<b>\$18</b>
\$40	<b>\$16</b>	<b>\$24</b>
\$50	<b>\$20</b>	<b>\$30</b>
\$60	<b>\$24</b>	<b>\$36</b>
\$70	<b>\$28</b>	<b>\$42</b>
\$80	<b>\$32</b>	<b>\$48</b>
\$90	<b>\$36</b>	<b>\$54</b>
\$100	<b>\$40</b>	<b>\$60</b>
x (any original price)	<b>0.4x</b>	<b><math>x - 0.4x</math></b>

11. How did you change the original equations (Y1 and Y2) to create the second table? **Answer: change the 2 to a 4 in both equations**
12. What would the discount be for an item that was originally \$40? **Answer: \$16**
13. What would the sale price be for an item that was originally \$60? **Answer: \$36**
14. What was the original price for an item that is \$72 during the sale? **Answer: \$120**
15. How can you find the sale price for an item that originally cost \$25? **Answer: change the  $\Delta Tbl$  to 5 and scroll to 25**
16. Suppose you have \$24.50 to spend. Find the original price for the most expensive item you can afford during the 40% off sale. **Answer: \$40.83**
17. Write a one-step rule to find the sale price for any item during a 40% off sale, using x as the original price. **Answer:  $y = 0.6x$  will find the sale price**