Taxes & Tips
ID: 11355

Activity Overview
In this activity, students will increase their understanding of the use of the formula T = r * p, which is encountered both in the real world and in the typical Algebra 1 class. They will calculate the amount of taxes and tips exactly, and then use estimation.

Topic: Linear Equations
- *Percents, using formulas*
- *Estimation & mental math*

Teacher Preparation and Notes
- *It would be beneficial for students to be familiar with navigating between pages (⒞ + ◀ or ⒞ + ▶), using sliders when they are minimized (click the associated up or down arrow), and toggling (⒞ + (tab)) between applications on the same page.*
- *This activity can serve as a good introduction to using formulas that involve percentage.*
- *The student worksheet provides instructions and questions to guide the inquiry and focus the observations.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "11355" in the quick search box.***

Associated Materials
- *TaxesAndTips_Student.doc*
- *TaxesAndTips.tns*

Suggested Related Activities
*To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.*
- *Discount Savings (TI-Navigator) — 5618*
- *Returns on a Share of Stock (TI-84 Plus family) — 4410*
- *Deposit and Forget It (TI-Nspire technology) — 9635*

Problem 1 – Percentage %

The definition for percent is reviewed on page 1.2.

Page 1.4 allows students to use the calculator to determine the percent as a decimal. Students can enter the percent sign in two ways, either by using the Catalog or the symbol menu.

They are to observe the pattern and describe how the decimal is moved when dividing by 100. They should see that the decimal moves to the left by two places.
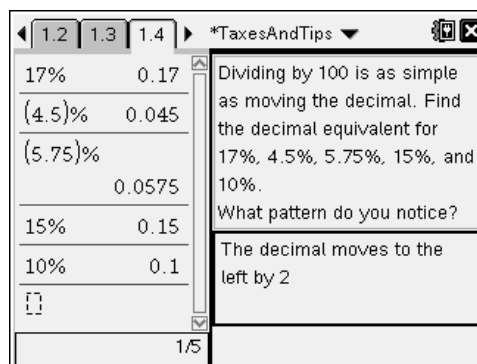
Problem 2 – $T = r \cdot p$

Page 2.1 explains the variables of the tax/tip equation, $T = r \cdot p$. For clarity, and to reinforce the concept, students should write down what the variables represent.

The spreadsheet on page 2.2 gives some hypothetical prices for various items that may be of interest to students. Students will select three of these items on page 2.4 using the arrows.
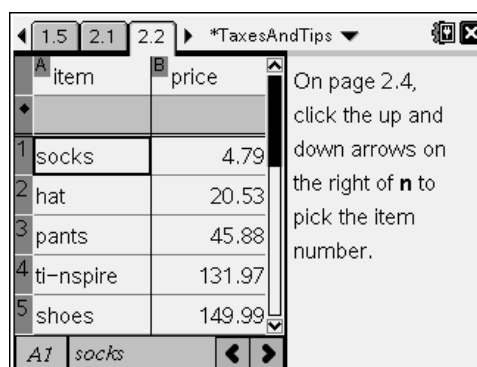
The dynamic model on page 2.4 shows proper solution procedure and notation. The tax rate and item price are adjustable.

Students are to use the *Calculator* application at the bottom to first calculate the sum of the tax on the three items, then calculate the sum of the items and multiply it by the tax rate to find the total amount of tax. Students should see that these amounts are almost the same, varying only by a penny. This is due to rounding when adding the amount of tax for each item.
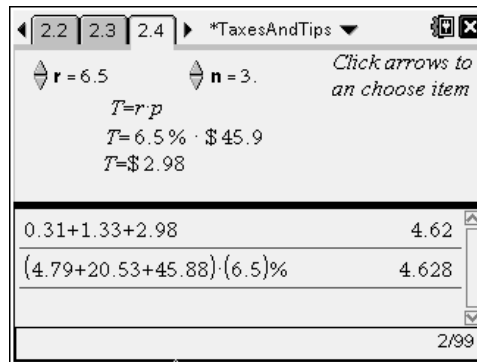
The amounts are so close because of the distribution property.

$$price \cdot tax + price \cdot tax + price \cdot tax = (price + price + price) \cdot tax$$
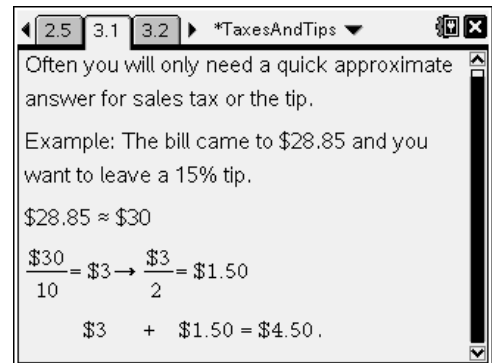
An internet search of "sales tax by state" will allow you to use the real information from various states. (One Web site containing this information is www.taxadmin.org/fta/rate/sales.html.)

Problem 3 – Taxes and Tips - Mental Math, Estimating

Page 3.1 gives an example of estimating 15% of an amount. They will use estimation or mental math to solve three other real-world tip questions.

The tab key (⒯) is a good way to navigate around a question page. ⒸⓉⓇⓁ + ▲ will review a problem if the answer is correct on these self-check questions. Press ⒸⓉⓇⓁ + ▼ to return.

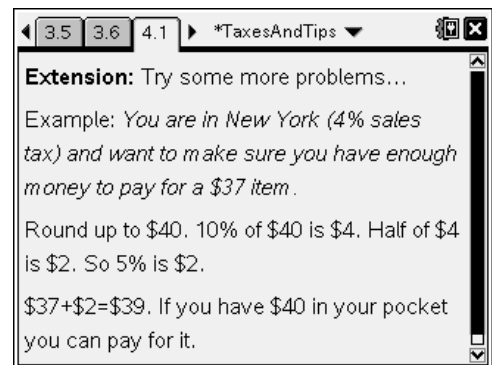To estimate 20% of a bill, students should round up to the nearest tenth and then multiply the first number by 2.

Extension

The example given on page 4.1 and the problem that follows changes the percent to a better number to make the estimation easier.

In the example, the tax on the item was estimated by estimating 5% sales tax instead of 4%. In the problem, students should multiply the tax rate by 2, using 15% instead of 7.25% to estimate the tip.