TI-Nspire Activity: *Percent Up or Down*
By: Jean McKenny

Activity Overview
This activity is designed to help students understand the concept of percent increase verses percent decrease. Research (done by Mendel in 1988) and (reported by Stavy and Tirosh in 2000) indicated that only 8% of eleventh grade students measured were able to answer the initial question in the activity correctly. The majority of the students studied (72%) believed incorrectly that the perimeter would stay the same if one side of a rectangle is increased by 20% while the other side is decreased by 20%.

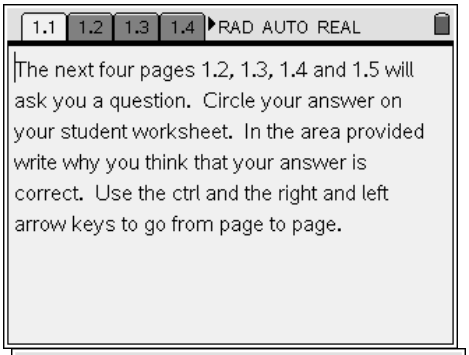
Concepts
Percent Increase and Percent Decrease

Teacher Preparation
The teacher should download the file percentupordown.tns and transfer it to student handhelds. The teacher should also provide a copy of the student worksheet for the activity to each student.

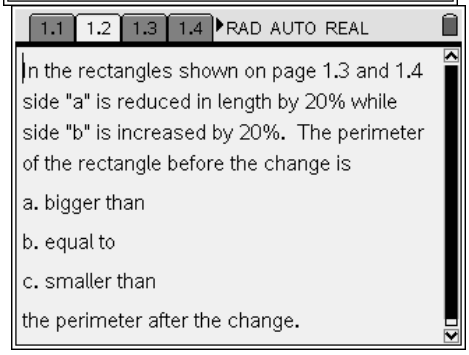
The Classroom.
The activity uses the notes and the graphs and geometry applications of the handheld.
*The **students should work individually** and **the teacher should NOT give students any help answering the first question in the activity.** The first question is a prompt designed to elicit student conceptual understanding or misunderstanding. The typical student will answer the question incorrectly. The activity then gives students an opportunity (later in the worksheet) to correct this incorrect answer. If students know how to use the handheld to "measure" the perimeter of a rectangle, they should be reminded that the directions in the activity say NOT to measure the rectangles to answer the initial question on the worksheet. Later in the activity the perimeters will be "measured" for the students.*

The Document

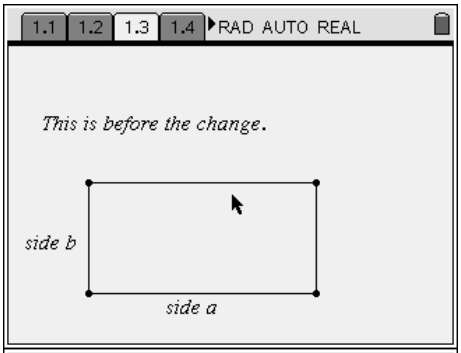
This page 1.1 explains what is to come in the activity.



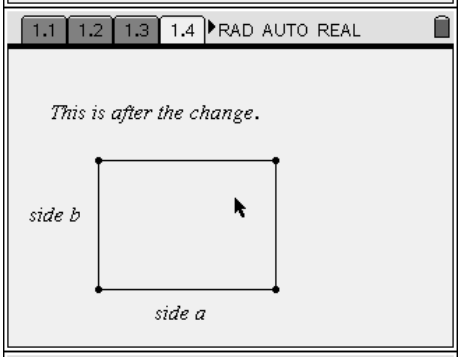
This page 1.2 is the prompt designed to elicit student conceptual understanding or misunderstanding. **Do not assist students in answering this question.** Students should be reminded that the directions say not to "measure" the rectangles in order to answer the question. The students should rely on prior math knowledge only to answer it.



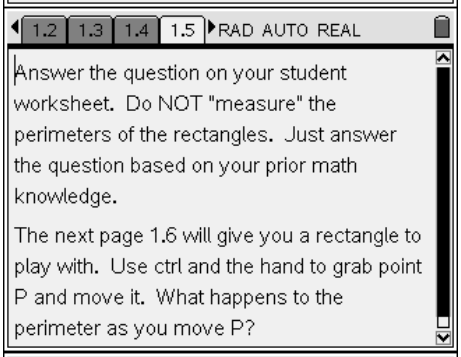
This page 1.3 provides a picture of the rectangle before the change.



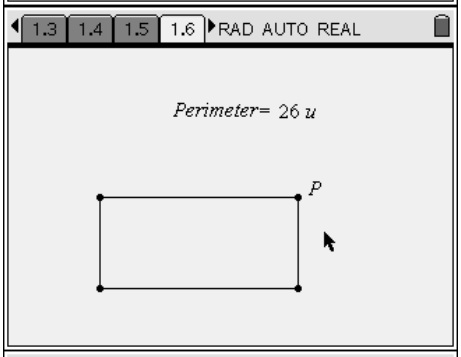
This page 1.4 provides a picture of the rectangle after the change. Students can go back and forth between pages 1.3 and 1.4 to see the before and after rectangles.



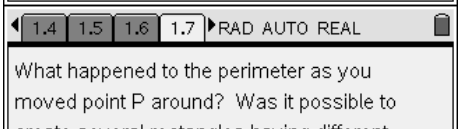
This page 1.5 directs the student to answer the initial question on the worksheet and NOT to measure the rectangle in order to answer it. It also provided beginning directions and questions for the next page.



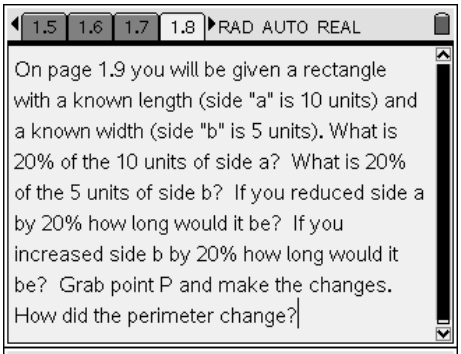
This page 1.6 gives students a rectangle so that they can (by grabbing and moving point P) see that many different rectangles with different shapes will have the same perimeter. It is included to give students practice with grabbing and changing the rectangle. It can also give students an awareness of the different lengths and widths of rectangles and reinforce that the adjacent sides are usually different in length (exception would be a square).



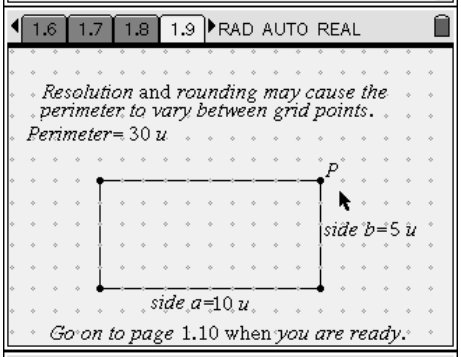
This page 1.7 asks several questions that the student should answer on the student worksheet. The last question is designed to see if students realize that there would actually be an infinite number of possible rectangles with a fixed perimeter.



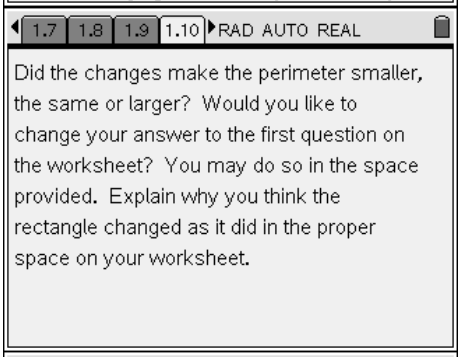
This page 1.8 is an introduction to having students actually calculate as well as manipulate a rectangle with initial sides of 10 (side a) and 5 (side b). The intent is that after students actually calculate 20% of 10 and 20% of 5 that they will realize that side "a" is reduced by a larger amount than side "b" is increased. This may cause them to want to change the answer that they gave to the initial question on the worksheet. The questions on this page should be answered on the worksheet.



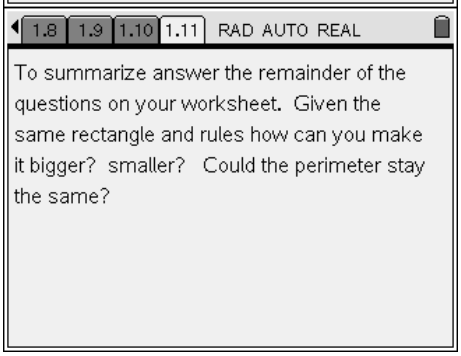
This page 1.9 is where the student can actually manipulate the rectangle and change it from a 10 X 5 to an 8 X 6. The perimeter should change from 30 to 28 and cause the students to realize that the correct answer to the initial question in the worksheet should have been "a". The rounding and resolution built into this page may cause the calculated perimeter in between grid points to be incorrect. The intent is to use the whole number grid points only.



This page 1.10 asks students what they discovered by making the actual changes and record answers on the worksheet. It also gives each student an opportunity to change his or her mind about the answer to the original prompt. Students can give the new answer. Students are asked why the rectangle changed as it did.



This summary page is designed to focus student thinking on the concept of percent. Students should reply that taking the same percent of a larger quantity will result in a larger number than taking the same percent of a smaller quantity. The perimeter could only remain the same if the initial rectangle given was a square. If a square, the same percent of each side would be the same as the quantities would be the same. This question is designed to solidify the concept that percent increase and percent decrease can only be the same if the initial quantities are the same.



Assessment and Evaluation

The teacher should quietly monitor the student worksheets during the activity. No help should be given to the students when they are answering the initial question on the worksheet. The activity is designed to measure if the student understands the concept (research shows that most will not) and then as the activity continues the student misconception should be corrected. When the teacher collects the student

worksheets s/he should pay particular attention to the student explanations as well as whether or not the answer is correct (Answer "a").