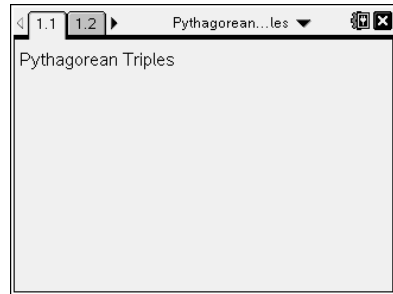**Pythagorean Triples**

Student Activity

Name _____

Class _____

Open or create the TI-Nspire document *Pythagorean_Triples.tns.*

This file has a right triangle constructed in such a way that the lengths of the legs are always whole numbers. You will drag the vertices and try to find whole number leg measures for which the measure of the hypotenuse is also a whole number.

Move to page 1.2.

Press (ctrl) ▶ and (ctrl) ◀ to navigate through the lesson.

1. Drag points *F* and *G*. Observe the measures of the sides of this right triangle. Triangle *EFG* was created in such a way that the measures of the legs are always whole numbers.

    a. Do you think the measure that appears on the hypotenuse is exact or approximate? Explain your thinking.

    b. If the sum of the square of the measures of the legs of a right triangle is a perfect square, what kind of number is the measure of the hypotenuse? Justify your answer.
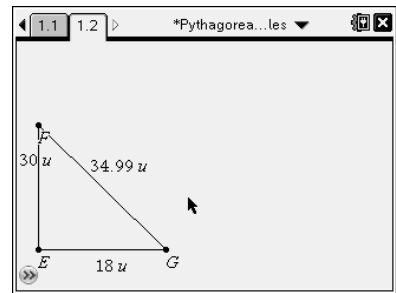
2. Drag points *F* and *G*. Try to find triangles where the measure of the hypotenuse is a whole number. Record the measures of the sides of these triangles in the table below.

FE	*EG*	*FG*
Leg Measure	Leg Measure	Hypotenuse Measure

3. The triples of numbers you recorded in the table above are called Pythagorean Triples. A Pythagorean Triple is a set of three whole numbers that could be the measures of the sides of a right triangle.

   a. Select one of the triples from the table in question 2. What is the greatest common divisor (GCD) of these three numbers?

   b. If the GCD is 1, then find the doubles of all three numbers. If the GCD is not 1, then divide each number by the GCD. Record the results below.

   Drag points *F* and *G*. Try to make a right triangle with these side measures.

4. If the GCD of the three whole numbers on a Pythagorean Triple is 1, then that triple is called a Primitive Pythagorean Triple. Primitive Pythagorean Triples can be used to generate other triples by multiplying each number by a whole number scalar.

   Drag points *F* and *G* to find a Primitive Pythagorean Triple. Record it in the table below. Drag points *F* and *G* or use other methods to find other Pythagorean Triples generated by this Primitive Pythagorean Triple. Record these and the scalar that will produce each in the table below.

	Scalar	*FE* Leg Measure	*EG* Leg Measure	*FG* Hypotenuse Measure
Primitive 1				

5. Which of the following are Pythagorean Triples? Justify each of your answers.

   a. 300, 400, 500

   b. 180, 181, 19

   c. 5, 5, 7

   d. 60, 65, 25

6. For each Pythagorean Triple you found in question 5, give the Primitive Pythagorean Triple that generated it and the whole number scale factor that was used.