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| **Synopsis of high-quality task:**Students will use different size squares to discover which square areas create acute, right, and/or obtuse triangles.**Anticipated student time spent on task:** 1 or 2 Classes (about 45 mins each class)**Student task structure(s):** Partner or small group work |
| [**Math Content Standards and Practices:**](http://www.doe.mass.edu/frameworks/math/2017-06.pdf)**8.G.B** Understand and apply the Pythagorean Theorem. **8.G.B.6.a** Understand the relationship among the sides of a right triangle. **8.G.B.6.b** Analyze and justify the Pythagorean Theorem and its converse using pictures, diagrams, narratives, or models. **SMP 1** Make sense of problems and persevere in solving them.**SMP 6** Attend to precision.**SMP 8** Look for and express regularity in repeated reasoning. |
| **Prior Knowledge:** **3.MD.C.5.a** A square with side length one unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.**4.G.A.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.**6.G.A.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.**8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3= p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. |
| **Connections to the real-world:**Architecture, Construction, Navigation, Surveying, Planning a Road Trip and Routes, Painting, Size of a TV |
| **Mastery Goals:****Learning Objective:**Students will be able to understand the relationships among the sides of a right triangle.**Language Objective:**Students will explain patterns they noticed when looking at the side lengths and areas of the squares that form different types of triangles. |
| **Teacher instructions****Instructional Tips/Strategies/Suggestions:**1. Print a set of perfect squares on cardstock for each pair or group.
2. Print copies of the worksheet.
3. In order to prepare the classroom, each group must have a set of perfect squares, worksheets for each student, paper for sketching, and protractors and/or angle rulers.
4. As students arrive, place them in groups.
5. Introduce the activity and allow students to explore.
6. Lead a class discussion to uncover their discoveries.
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| **Instructional Materials/Resources/Tools:** * Set of perfect squares on cardstock (Materials: Set of squares labeled with areas: 1u2, 2.25u2, 4u2, 6.25u2, 9u2, 12.25u2, 16u2, 25u2)
* Extra paper for sketching
* Pencils
* Protractor or angle ruler
* See attached worksheet.
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| **Accessibility and Supports:** **Potential sentence starters**: I noticed…...because….When an acute triangle was formed, I noticed…When a right triangle was formed, I noticed…When an obtuse triangle was formed, I noticed...**Key academic vocabulary**: Perfect square(s), sides, vertices, acute triangle, scalene triangle, obtuse triangle, hypotenuse, legs, right angle |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Instructions:

1. Using three different size squares, connect their vertices to create a triangle.
2. Record the information of the three squares and the type of triangle that they create in the table below.

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| --- | --- | --- | --- | --- | --- | --- |
| Square SmallSide length(units) | Square Med.Side length(units) | Square LargeSide length(units) | Square SmallArea (sq. units) | Square Med.Area (sq. units) | Square LargeArea (sq. units) | Type of Triangle |
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1. Sort your data into the three different types of triangles: Right, Acute and Obtuse

Right Triangles:

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| --- | --- | --- | --- | --- | --- | --- |
| Square SmallSide length(units) | Square Med.Side length(units) | Square LargeSide length(units) | Square SmallArea (sq. units) | Square Med.Area (sq. units) | Square LargeArea (sq. units) | Type of Triangle |
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4. What pattern do you notice for Right Triangles? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Acute Triangles:

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| --- | --- | --- | --- | --- | --- | --- |
| Square SmallSide length(units) | Square Med.Side length(units) | Square LargeSide length(units) | Square SmallArea (sq. units) | Square Med.Area (sq. units) | Square LargeArea (sq. units) | Type of Triangle |
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1. What pattern do you notice for Acute Triangles? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Obtuse Triangles:

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| --- | --- | --- | --- | --- | --- | --- |
| Square SmallSide length(units) | Square Med.Side length(units) | Square LargeSide length(units) | Square SmallArea (sq. units) | Square Med.Area (sq. units) | Square LargeArea (sq. units) | Type of Triangle |
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1. What pattern do you notice for Obtuse Triangles?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Sample Student Work:****Student Work. Shows a table with small, medium and large side lengths and area, as well as the type of triangle that it is (obtuse, acute or right)Student work showing numbers 3, 4, 5 and 6. Number 3 includes tables categorizing triangles into right, obtuse or acute, as well as the dimensions of each triangle. Number 4: "The two smaller sides, once squared, equal the bigger line when squared." Number 5: "The two shorter lines, once squared and added, are greater than the long line." Number 6: "When the two shorter lines are squares and added together, they equal a greater number than the longer line."** |