



Description

- Develop and apply the formula for finding the area of a triangle.

Materials

- grid paper
- *The Geometer’s Sketchpad*[®]
- BLM 14.1

Assessment Opportunities

Minds On ...

Whole Class → Connections

Students find the area of their textbook cover and estimate areas of various shapes in the classroom, e.g., desktop. Ask: How does the area of your desktop compare to the area of your textbook cover? Collectively create a chart listing several items with area of 1 m², 1 cm², ... including various shapes.

Action!

Pairs → Guided Exploration

On grid paper, pairs of students draw five shapes: a square, a rectangle, a rhombus, and two different parallelograms. The partners consult and agree on the areas of all ten shapes. They cut out the shapes, and fold or cut each shape into two congruent triangles and predict the area of the triangles. Students record their observation of the relationship between the area of a triangle and a quadrilateral.

Whole Class → Connections

Discuss the students’ observations and determine a general rule for the relationship, such as the triangle area is always half of the partner quadrilateral. It is important that the rule be stated in students’ own words. Draw a triangle and invite volunteers to use dotted lines to complete a “partner quadrilateral,” noting base and height. Encourage various solutions, and predict and calculate areas. Provide written solutions using good form for last few examples used.

Pairs → Investigation Connections

Curriculum Expectations/Performance/Rubric: Assess students’ problem-solving skills and appropriate use of mathematical language either by listening to their discussion or by requiring them to submit a written summary of the work.

Provide small groups or pairs of students with BLM 14.1 on a transparency. Students add triangles of equal area and justify their additions in at least two different ways. They do this by counting squares for area, by referencing base and height, or by using partner quadrilaterals. In addition to gaining confidence in conjecturing and validating statements, students develop an understanding that two or more triangles with the same area (and the same height and base) can have different shapes. The shape is determined by size of the angles.

Alternately, provide a *Geometer’s Sketchpad*[®] visual demonstration of the vertex of a triangle moving along a line parallel to the base of the triangle with the measurement of area calculated for each new position.

Consolidate Debrief

Whole Class → Discussion

Students suggest applications of the area of triangle, e.g., space needed on a cookie sheet to bake a turnover.

Students work on selected questions requiring recognition of base and height and calculations of area of triangles and quadrilaterals.

Home Activity or Further Classroom Consolidation

Draw shapes to illustrate situations where:

- the area of the triangle is $\frac{1}{4}$ the area of the parallelogram;
- the area of the triangle is two times the area of the parallelogram;
- the area of the triangle is equal to the area of the parallelogram.

In each case, draw a diagram of the shapes to explain the results.

Partner quadrilaterals are quadrilaterals constructed by a triangle and a transformation of the triangle (reflection, translation, rotation). Since they are comprised of two congruent triangles, the area will always be double the area of one triangle.

Triangles may have multiple partner quadrilaterals.

Some students may calculate area by counting the squares on the grid paper, while others may use known formulas, such as $A = l \times w$.

While students may be familiar with the formula for area, the emphasis should be on inquiry and communication.

If computers are available, students can access the interactive lesson http://illumination.s.nctm.org/mathlets/IGD_areas/index.html

Select a student to add vocabulary to the Word Wall.

Concept Practice

14.1: Triangles

Name:

Date:

Draw other triangles that have the same area as the one constructed below. Justify that the areas for your triangles are the same. Use at least two different methods for justification.

