Elementary Mathematics Methods
Video Guide Sheet

Geometry: Plane

Focus
- Rectangle

Concepts To Think About
- The formula for the area of a rectangle is Area = length x width.

Vocabulary
- Rectangle – a quadrilateral with four right angles, opposite sides parallel and opposite sides of the same length.
- Quadrilateral – a polygon having four sides.
- Area – the amount of space covered by a plane figure

Tools
- geoboard

Process
- A rectangle is a quadrilateral with four right angles, opposite sides parallel and opposite sides of the same length.
- The learner makes a rectangle on the geoboard.
- This rectangle is 4 units in length and 3 units in width.
- To determine the area of the rectangle, the learner is dividing the rectangle into square units.
- This rectangle has 12 square units.
- 3 units x 4 units = 12 square units.
- The formula for the area of a rectangle is Area = length x width.

Try Another Example
- Using a geoboard, make a rectangle that is 5 units in length and 3 units in width.
- Use the formula for the area of a rectangle to find the area of the rectangle you made.

Authors: Yadera Ali and Thomasenia Adams
University of Florida

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Geometry: Plane

Focus
- Square

Concepts To Think About
- The formula for the area of a square is Area = length^2.

Vocabulary
- Square – a quadrilateral with four right angles, opposite sides parallel and all sides of the same length.
- Quadrilateral – a polygon having four sides.
- Right angle – an angle of 90°
- Area – the amount of space covered by a plane figure

Tools
- square tiles

Process
- A square is a quadrilateral with four right angles, opposite sides parallel and all sides of the same length.
- To determine the area of this square, the learner covers the figure, a square, with square tiles and then counts the number of square tiles used.
- This square is 4 inches in width and 4 inches in height.
- This square has 16 square inches.
- 4 inches x 4 inches = 16 square inches.
- The formula for the area of any square is Area = length x width but since the length and width are equal, Area = length x length = length^2.

Try Another Example
- Using square tiles, make a square that is 5 units in length.
- Use the formula for the area of a square to find the area of the square you made.

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Geometry: Plane

Focus
- Non-right Angle Parallelogram

Concepts To Think About
- The formula for the area of a parallelogram is Area = base x height.
- The area of the parallelogram is the same as the area of the rectangle.

Vocabulary
- Parallelogram – a quadrilateral with opposite parallel.
- Quadrilateral – a polygon having four sides.
- Right angle – an angle of 90°
- Area – the amount of space covered by a plane figure

Tools
- paper parallelogram

Process
- A parallelogram is a quadrilateral with opposite parallel. Some parallelograms have right angles (e.g, rectangles, squares) and some do not have right angles (e.g., non-square rhombi).
- Observe the non-right angle parallelogram, its width, (base) and its height.
- To determine the area of the parallelogram, the learner applies the idea that the area of a figure is unchanged by manipulation of the figure.
- A triangle is cut from the parallelogram and translated to the other side of the parallelogram to form a rectangle.
- The area of the parallelogram is the same as the area of the rectangle.
- We know that the area formula for a rectangle is Area = length x width so the area of the parallelogram is Area = length x width.
- Using language common to parallelogram, we say that the formula for area of the parallelogram is Area = base x height.

Try Another Example
- Using a paper parallelogram, make a parallelogram that is 5 units at the base and 4 units in height.
- Follow the process and use the formula for the area of a parallelogram to find the area of the parallelogram you made.

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University of Florida

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Geometry: Plane

Focus
- Triangle

Concepts To Think About
- The formula for the area of a triangle is Area = (1/2)(height x base).
- So the area of one triangle is one-half the area of the rectangle.

Vocabulary
- Triangle – a three-sided polygon.
- Area – the amount of space covered by a plane figure
- Right angle – an angle of 90°

Tools
- geoboard

Process
- A triangle is a three-sided polygon.
- To determine the area of a triangle, the learner first builds a rectangle on the geoboard.
- The formula for the area of a rectangle is Area = length x width.
- Now the learner shows the rectangle in half.
- Half of a rectangle is a triangle.
- So the area of one triangle is one-half the area of the rectangle.
- This means that the formula for the area of a triangle is Area = (1/2)(length x width).
- Using language common to triangle, we can say that the formula for area of the triangle is Areas = (1/2)(height x base).

Try Another Example
- Using a geoboard, make a triangle that is 5 units at the base and 3 units in height.
- Follow the process and use the formula for the area of a triangle to find the area of the triangle you made.

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Geometry: Plane

Focus
- Triangle

Concepts To Think About
- The formula for the area of a triangle is Area = (1/2)(height x base).
- The area of a triangle is one half of the area of a non-right angle parallelogram

Vocabulary
- Triangle – a three-sided polygon.
- Right angle – an angle of 90°
- Area – the amount of space covered by a plane figure
- Congruent – coinciding exactly when superimposed

Tools
- paper triangles

Process
- A triangle is a three-sided polygon.
- There are other ways to determine the area of a triangle.
- The learner moves the two congruent triangles together to form a non-right angle parallelogram.
- The formula for the area of a parallelogram: Area = length x width.
- This means that one half of the area of a parallelogram is Area = (1/2) (length x width).
- This means that the formula for the area of one of the triangles is Area = (1/2)(length x width).
- Using language common to triangle, we can say that the formula for area of the triangle is Areas = (1/2)(height x base).

Try Another Example
- Using a paper triangle, make two congruent triangles that are 6 units at the base and 3 units in height.
- Follow the process and use the formula for the area of a triangle to find the area of the triangles you made.

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Geometry: Plane

Focus
- Trapezoid

Concepts To Think About
- The formula for the area of a trapezoid is Area = (1/2)(a+b)(height).
- The area of the rectangle is the same as the area of the non-right angle parallelogram and is the same as the two trapezoids put together.
- The area of one trapezoid is half of the area of a rectangle.
- The area of one trapezoid is half of the area of a non-right angle parallelogram.

Vocabulary
- Trapezoid – a quadrilateral with exactly one pair of parallel sides.
- Area – the amount of space covered by a plane figure
- Congruent – coinciding exactly when superimposed

Tools
- paper trapezoid

Process
- A trapezoid is a quadrilateral with at least one pair parallel sides.
- What is shown here are two trapezoids with exactly one pair of parallel sides.
- The learner determines the formula for the area of a trapezoid by placing the two congruent trapezoids together to form a non-right angle parallelogram.
- We already know the area formula for the non-right angle parallelogram: Area = length x width.
- Note the learner moves a triangle from the side of the non-right angle parallelogram to build a rectangle.
- The area of the rectangle is the same as the area of the non-right angle parallelogram and is the same as the two trapezoids put together.
- This means that the area of one trapezoid is (1/2)(length x width).
- In this case, the length is made up of the two bases of the trapezoid, these are usually denoted a and b and width is usually called height.
- So the formula for the area of a trapezoid is Area = (1/2)(a+b)(height) = (1/2)(a+b)(h).

Try Another Example
- Using paper trapezoids, make two congruent trapezoids that are 4 units at the base and 3 units in height.
- Follow the process and use the formula for the area of a trapezoid to find the area.

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University of Florida

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Geometry: Plane

Focus
- Circle

Concepts To Think About
- The formula for the area of a circle is Area = $(1/2)\text{pi}(r)^2$.
- The formula for the circumference of a circle is C = 2(pi)(r).

Vocabulary
- Circle – a plane figure that is the set of points that are equidistant from a given point
- Circumference – the distance around a circle
- Radius – the distance from the center of the circle to any point on the circle
- Diameter – the distance from one point on the circle to another point on the circle and through the center

Tools
- paper circle, circle wedges

Process
- The learner has taken a circle and cut it into many wedges.
- The key to determining the area formula for a circle is knowing that the circumference of a circle can be determine by the formulas C=2(pi)(r) and using the process of simulation.
- The wedges of the circle can be alternately placed to simulate a rectangle.
- We know the formula for the area of a rectangle: Area = length x width.
- The length of the rectangle is one-half the circumference of the circle.
- The other one-half circumference of the circle is on top of the rectangle.
- The width of the rectangle is the same as the radius of the circle.
- Therefore the area of the simulated rectangle, in fact the circle, is (one-half circumference) x radius.
- Given that circumference is C=2(pi)(r), using substitution yield the area of the circle as (one half)(2)(pi)(r)(r) or pi(r)(r) or pi $(r)^2$.

Try Another Example
- Using a paper circle, make a circle with a radius of 3 units.
- Follow the process and use the formula for the area of a circle to find the area of the circle you made.

Authors: Yadera Ali and Thomasenia Adams